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THE CHEMICAL ENGINEER AND THE BRASS FOUNDRY.

He Is Rapidly Becoming an Important Factor in the Economical Production of Brass and Bronze.

By Chas. T. Bragg.*

Following the natural direction indicated by the course of production, since science has been wedded to the arts, the chemical engineer is steadily, but surely, making himself a powerful factor in the manufacture of brass and bronze. It is no longer possible to contend with any basis of fact, or with any courage based on accurate knowledge, that the "brass foundry" is trailing sister to the "iron foundry" by a half century. True, due to its almost limitless possibilities, its breadth of opportunity, its wealth of reciprocal industry, it has not yet reached that summit of all endeavor, perfection. Many sources of knowledge have sent their contributions flowing through a common channel, and many agencies have taken these, correlated and applied them to the art whose natural uplift has resulted. The manufacturers of brass goods, the numerous makers of accessories, the refiners, the publishers, the physicists and the chemical engineers have contributed, and not the least of these is the chemical engineer. It is of him in particular that we are to speak; what he has done, what he is doing and what he yet may do to systematize and improve the art.

CHAS. T. BRAGG.

THE CHEMICAL ENGINEER.

Before proceeding further it may be well to decide just what is meant by the title "Chemical Engineer." Webster describes a chemist as, "One versed in the science of the composition of substances and the changes which they undergo." And an engineer as, "One versed in the science and art of utilizing natural forces and materials." Of applied chemistry he says, "That which treats of chemical products useful in the arts or for economical purposes." It would, therefore, appear that a chemical engineer is one versed in the science of composition and change of composition of matter, who utilizes natural forces and materials to produce results for economical purposes or use in the arts.

What industry exists that needs a man who can answer the above description more than the brass and bronze industry? Certainly none needs him more, and few as much. When one pauses to consider the infinite number of compositions capable of production from the non-ferrous elements, as infinite as the number of compositions that may be written for the piano, and the endless maladies and causes of diseases to which brass and bronze are heir, it becomes obvious that there is always to be room for the student. It was conveyed indirectly, just before, that the brass foundry has taken some large steps forward in recent years. Many of these steps were forced by dire need, and with few of them was any chemical engineer initially associated. It is with their perfection and their ultimate use as well as their discriminate selection, that the chemical engineer has been and is to be concerned.

CHEMICAL LABORATORY.

Possibly the greatest step forward as far as pure science is concerned, has been the advent of the chemical laboratory. A well-equipped chemical laboratory is an essential factor in any well-regulated and managed brass and bronze manufactory whose bulk of business will justify the necessary expenditures. The point is getting beyond question of dispute. Just now, the question of just how large an institution can afford a chemical laboratory is receiving some attention. Of course, the question is purely local as to discussion and arouses some peculiar argument. Suffice it to say here that an institution would be necessarily diminutive to be entirely outside the need of a chemical laboratory in one way or another, whether its own or not, it, of course, would have to determine. The laboratory is, of course, of value only, to go back to our definition, as "It utilizes natural material to produce results for economy in the arts." To discuss just how the laboratory can do this in all its detail is obviously as unnecessary as impossible.

Its general functions, however, are easily summed up to be practically those of a policeman, keeping an eye on materials purchased, keeping them in the straight and narrow path while in the plant and seeing that they are in the proper condition before they go out again. Give the factory a good chemical engineer and he will build a clever system of standards that will make the above things easy. The chemical engineer should be the first piece of equipment, and the rest of the things for a brass foundry laboratory will come fast enough. It is a familiar thing to all chemists to see laboratories full of unopened bottles and rusted apparatus, put in by either someone who thought efficient laboratories could be bought by the peck or by someone who was starting his work backwards. In other words, a real efficient chemical laboratory for the brass foundry should be equipped thoroughly to do the work well and contain nothing that is not working its own way. This is all mentioned because of the

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tendency of some manufacturers to think that a laboratory is a row of bottles and a set of "scales," and also to indicate that the laboratory is merely an aid to the chemical engineer. The laboratory with a "chemist" is not worth nearly as much as the chemical engineer who has a "laboratory."

INSPECTION OF MATERIALS.

One of the most important and oftenest overlooked sources of loss in the average brass foundry lies in materials purchased. Most of this is due to the fact that we are still hampered by some people who charge us for one thing and give us another. However, some losses occur due to lack of knowledge on the part of the foundryman as to just what he wants. For example, an expensive material may often be cheaper than a cheap one, or a cheap one may often be just as well for a purpose as a dear one, but unless such facts be known a loss one way or the other may occur. By various tests and experiments the chemical engineer can determine the economy and efficiency of various substances, draw up definite purchasing specifications, and through his laboratory see that he gets what he orders and pays for.

STANDARD MIXTURES.

It has just been said that quality of materials purchased, goods manufactured and goods sold form the three things which should receive the most attention of the chemical engineer. Of these the second is undoubtedly most important. Just now considerable work is being done to manufacture alloys of standard or uniform composition—that is—standard for any one concern. The following extract by the writer from the June, 1909, issue * will show on its face just how much the chemical engineer is needed for such work.

"Several factors are important to the successful standardization of alloys. Good original alloys, complete knowledge of materials to be used in their manufacture, control of the furnaces in which they are made, knowledge of the changes and causes of the changes taking place in those furnaces, and complete knowledge of the composition of the resulting alloy, are the chief ones to consider. The choosing of suitable alloys is, of course, largely a matter of personal decision, but that decision is often influenced by factors unknown to the one making such decisions. In other words, in experimenting to find the most suitable alloy for a class of work, absolute knowledge of the quality of the materials used and results attained is essential. For this knowledge we must turn to the science of chemistry. It is not so much a question of whether we have produced what we want, as it is whether we have complete data on what we have produced, and whether we can repeat the production of that article."

FOUNDRY ACCESSORIES.

The chemical engineer has done and may do much of his good work on the equipment of his foundry. Certain it is, that furnaces, fluxes, sands, metals, etc., will all need more or less watching and discipline if a foundry is to give maximum results from a minimum expenditure. Certain it is, that certain kinds of equipment suit certain factories and certain conditions, and tests of economy by one trained for the work is the best means of selection.

SUMMARY.

Because he can select raw materials with wisdom, because he can shape to his fancy the constituents of an alloy, because he has a keen scientific insight into the chemical magic of gases, etc.—because he realizes the limits of human endeavor, because he can apply to an art all the accumulated knowledge of a science; the chemical engineer is with the brass foundry to stay.

CARTRIDGE CASES: A DESCRIPTION OF THEIR MANUFACTURE AND USE.

A SKETCH OF THE VARIOUS KINDS OF POWDER-CASES USED IN MODERN FIREARMS.

(Concluded from January.)

BY OBERLIN SMITH.†

In Fig. 10 is shown a series of operations as performed in making a cartridge case of average form and of any size from a small pistol cartridge up to one for a cannon. The views are in vertical axial section with a top view also of the "blank" or circular disk A as made with ordinary cutting dies from a flat sheet of soft metal. This is usually brass, made of two-thirds copper and one-third spelter. At B is shown the "cup" as it is technically termed, which is made at one draw from the blank. This operation is often called "cupping," although it is really of the same nature as the remaining ones which in shop parlance are called draws—as "the first draw" (or drawing)—to bring it to the stage C, the next to bring it to D and the next to E, etc. The case, in all the stages beyond the cup, is usually called a "shell," and these terms, blank, cup and shell will be hereinafter used.

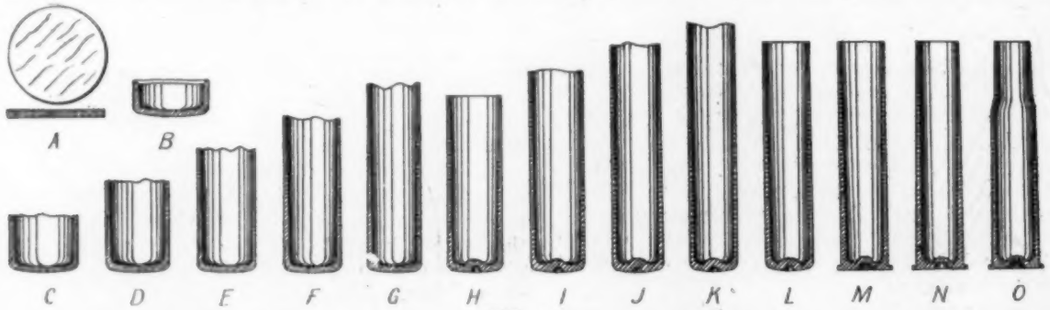


FIG. 10.

It will be noticed that the bottom of the shells remain of the ordinary thickness of the sheet metal while the sides are tapered so that they finally become very thin at the top end. All this is arranged for by making the punches tapering, so that there is less and less space on each successive die between the inside of the die and the outside of the punch at its upper end. This process "broaches," or in other words squeezes thinner, the walls of, and at the same time

*THE METAL INDUSTRY.

† President Ferracute Machine Company, Bridgeton, N. J.

elongates, the shell to a considerable amount at each draw. It is an interesting sight to watch the metal being squirted away from the die and crawling up the punch as it descends. The bottom of the cup might be left flat but is naturally a little bulged by the action of the metal in springing slightly away from the bottom of the punch because of there not being any flat anvil-like bottom to the dies. The dies are purposely made open at the bottom that the work may drop through.

After some six or seven operations, as at G, the metal flows so unevenly as to look somewhat ragged at the open end. It is then put into a trimming lathe and an inch or two of uneven and sometimes slightly split metal is cut off, so that it appears flat again, as at H. It is customary at about this point to "indent" the bottom of the shell in the center, as at H, in a separate press, although this might be done later on. The drawings then proceed three or four more times until the top end is again ragged, as at K, when another trimming brings it to the condition L, it being then of the final size required, both inside and out. Both die and punch for this operation are made especially accurate in regard to diameter and roundness, that the finished work may be uniform. Obviously the exact diameters of the other operations do not signify, and in their case more wear to the dies may be allowed before corrections are made.

HEADING, TAPERING AND SHOULDERING.

The next operation is known as "heading," as shown at M. This consists in inserting in the open end of the shell a mandrel placed inside of a long die which protects the outside from bulging and then bringing upon the closed end a very heavy pressure which causes the metal to swell and flow out into the projecting rim. This also completes the indention and forces it down into proper shape for receiving the "primer," to be mentioned later on.

The next operation, as at N, is known as "tapering," where the shell is forced into a tapering die and contracted somewhat at the open end in order that it may easily enter the chamber of the gun and yet fit centrally when completely in.

The next operation, as at O, sometimes known as "shouldering," is to reduce a short section of the open end to a still smaller diameter by forcing it into a die which contains a mandrel of the proper size, the object being to adapt it for a projectile which is of considerably smaller diameter than the shell itself. The shell is here shown with the head turned and the primer hole drilled. In some kinds of cartridges this is not necessary, the shape being left as at N, in which case the chamber of the gun is not much larger than the barrel.

PRESSES AND DIES EMPLOYED.

All operations above described may be performed in a single-action press, the working part of the lower die being simply a ring of hardened steel with a cylindrical internal surface, usually from ½ in. to 1½ in. long, according to the size of the work. This flares out into a conical shaped recess large enough at the top for the bottom of the shell, as drawn in a previous operation, to enter and be centered thereby. The punch is of course made of an approximately cylindrical form but tapered and rounded off at the bottom to fit the interior shape of the shell. Such an operation is one of the simplest that can be performed in dies. The work being pushed through at the bottom, catches on the sharp lower edge of the die and is thereby stripped from the punch, it being slightly expanded by its own elasticity in passing through. In some instances, however, the work pulls up through the die in an annoying way. This is easily remedied by spring strippers situated on the inside of the die near the bottom below the working part. These push out as the work passes through and close in over the top

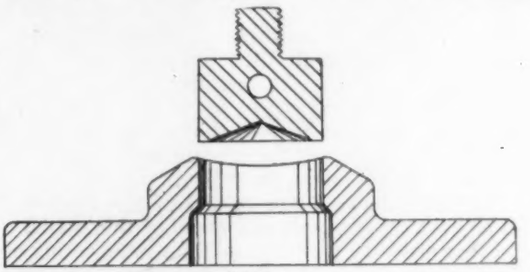


FIG. 11.

edge of it to prevent its rising. They are in the form of little hinged or sliding pawls with the upper edge bevelled and the lower edge sharp and hard and each so arranged they cannot spring far enough in to strike or mar the punch.

In Fig. 11 is shown in axial section a pair of cutting

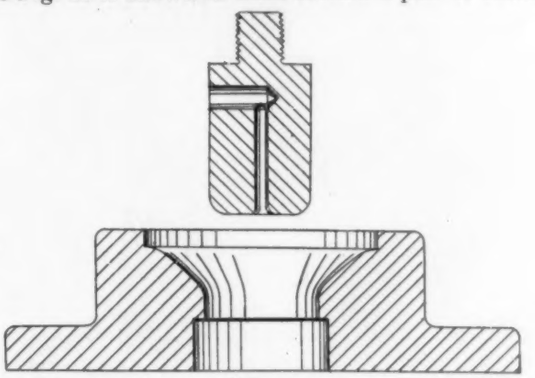


FIG. 12.

dies of about an ordinary type, suitable for making blanks.

In Fig. 12 is shown a pair of cupping dies of the kind referred to. It will be noticed that the small

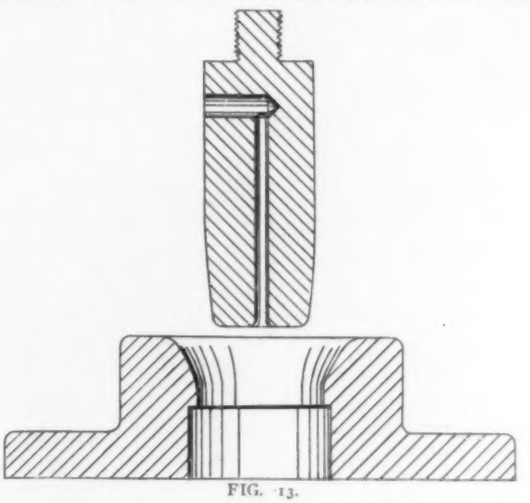


FIG. 13.

ledge at the top, on which lies the blank, has a vertical surrounding wall which serves as a guide to keep the blank central until it is started down.

In Fig. 13 is shown a typical pair of drawing dies

of about average construction for one of the later operations. The dies for the intermediate operations are of the same general form, but with comparatively shorter punches.

This system of single-action drawing is entirely different from the double-action drawing process, in which an outer zone of the blank is prevented from wrinkling by being powerfully clamped while the punch descends through the upper die and pulls the metal from between the clamping surfaces. The wrinkles which are trying to form are prevented and the metal is caused to flow so that it stretches radially and crowds itself together circumferentially, the thickness remaining the same as at first.

In Fig. 14 is shown a pair of dies of this kind, such as would be used for a cup-shaped vessel of thin metal. The reason that ordinary cartridges do not require this blank-holding process is because the metal is so thick that the wrinkles do not attempt to form, but the particles simply crowd themselves together. Very little cartridge work is made by the double-action process except sometimes the cups for small-arm work, where the cutting and forming is all done at one stroke. Even in this case, the metal is usually thick enough to require little, if any, pressure by the blankholder.

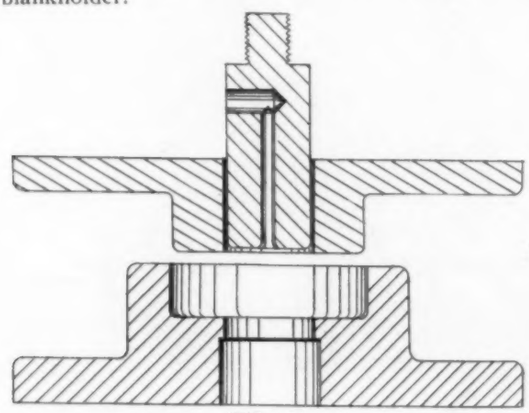


FIG. 14.

An exception to this latter condition sometimes occurs in drawing the thin large shells for the caps which are put upon the head end of paper cartridges for shot-guns—as in Fig. 6. Obviously, dies of the form of Fig. 14 may be cut at the same time that they draw. In such case the cylindrical guiding ring terminates in an acute cutting edge at the top, it and also the lower edge of the "blank-holder" (upper die) being properly hardened.

FINAL OPERATIONS.

After the above-named operations have been performed upon a case, with perhaps a subsequent one in the way of punching a small hole through the head for access from the primer to the gunpowder (in some cases these are drilled) there are certain finishing operations performed in special lathes. These are the final trimming of the open end, the truing up and sizing of the flange around the head and also the flat end of the head and primer recess, etc.

After the cartridge is assembled by inserting the primer with its fulminate, the explosive powder and the projectile, the latter is usually held firmly in the case by rolling a bead or beads from the outside, projecting internally into one or more grooves in the projectile. In a similar manner the brass is secured to the pastboard tube in the shot-gun cartridges. The making of the primer need not here be described. It is usually a small cup charged with fulminate which is inserted into the recess in the head of the case, snugly fitted therein and serving as an anvil for the blow of the hammer or other percussive instrument forming a part of the mechanism of the gun. These primers are usually cut and drawn at one operation from a sheet of metal. The writer at one time designed and built for making these small primers for rifle cartridges certain double-action presses with a gang of sixteen pairs of dies mounted therein and with an automatic feed. The result was a product from each press of over one million cups per day direct from a sheet which the machine itself took from a roll of metal, one boy being able to attend to several of these presses. Such a primer therefore cannot be considered a very expensive component of the cartridge.

Dies of solid steel, as in Fig. 13, are very expensive when made in large sizes—both in material and workmanship. They are, moreover, difficult to harden, as such masses of steel do not cool quickly enough. If made of high enough carbon percentage to harden readily, they are liable to crack when dipped. Even when successfully made they soon wear too large and cannot be cheaply repaired.

Some years since the writer made a radical improvement in their construction as shown in Fig. 15. The working surface of the die is the inside of a thin ring which is very cheap to make and which will harden easily to great hardness. This is conical on the outside and is forced into a cheap cast-iron chuck of massive design. The ring is thus put under initial compression, the same as are the inner rings of a built-up cannon. The chuck is of course under tension but is amply strong. As the work is pushed through the ring it expands about up to "neutral" only, but never

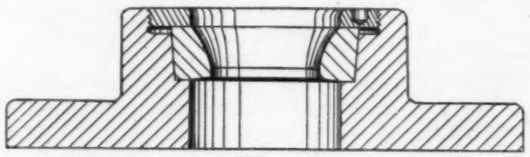


FIG. 15.

up to the point of tension so that it would tend to split apart. Such rings can be made a little smaller when warm by forcing them further down. If much too large they can be heated and forced down until smaller, and then cheaply re-hardened. A number of large dies were made in this way for a European government and were very successful. Since then they have come into use by our own government and by various other people.

PLATER'S WRINKLES.

It is well to note that aluminum dipping baskets cannot be used in potash solution or in muriatic or hydrofluoric acids. These chemicals dissolve aluminum very rapidly, while the strong mineral acids, such as sulphuric or nitric acids have no perceptible action upon the metal.

The best method to pursue in neutralizing the free acid in the pores of iron castings after pickling in hydrofluoric acid or any other acid, is to prepare a warm bath of commercial sulphate of ammonia. Standing articles are boiled out well in boiling water. They should be immersed in the sulphate of ammonia solution for ten or fifteen minutes. This method will give a more satisfactory deposit especially when nickeling iron. Always add a little sal soda to the water in which iron or steel articles are immersed after cleansing or scouring while waiting for plating, this prevents oxidation.

THE PATENT CONTROVERSY OVER BEARING METALS.

Continued Discussion Regarding Copper-Tin-Lead Alloys.

By Andrew Allan, Jr.*

In reading G. H. Clamer's paper published in the November issue of The Metal Industry I am surprised to see that it tends to be an attack on the worth of Allan No. 1 metal, an alloy of 50 per cent. lead and 50 per cent. copper, rather than a reply to my paper. As in my previous paper,† I shall endeavor to answer any specific point brought out by Mr. Clamer, and avoid as much as possible any personal comments on the worth of plastic bronze, other than such as become absolutely necessary in support of my contentions.

The photo-micrographs shown in my September paper, like those presented herewith, were not made with any attempt at deception; they were not taken from specially prepared specimens, with the object of presenting the most favorable conditions possible, but were produced from actual merchantable castings. From a cast of each of these various alloys we have taken a journal, and also a journal from several of plastic bronze which we procured on the open market. From the center of each of the journals we have cut a ⅜-in. wide strip, as shown in Fig. 1.

FIG. NO. 1.

From approximately the same position on all the specimens of these various alloys under consideration we have made our microscopic examinations, from which resulted the photo-micrographs herein presented. Photo-micrographs A and Aa are specimens of plastic bronze bought on the open market. Photo-micrographs 5 and 5a are specimens of our mixture of 58½ per cent. copper, 35 per cent. lead and 6½ per cent. tin, or approximately 11 parts tin to 89 parts copper in the mix. Photo-micrographs 6 and 6a are specimens of our mixture of 62½ per cent. copper, 30 per cent. lead and 7½ per cent. tin, or approximately 12 parts tin to 88 parts copper in the mix. Photo-micrographs 7 and 7a are specimens of our mixture of 67 per cent. copper, 24 per cent. lead and 9 per cent. tin, or approximately 13 parts tin to 87 parts copper in the mix. Photo-micrographs 8 and 8a are specimens of our mixture of 70 per cent. copper, 20 per cent. lead and 10 per cent. tin, or approximately 14 parts tin to 86 parts copper in the mix.

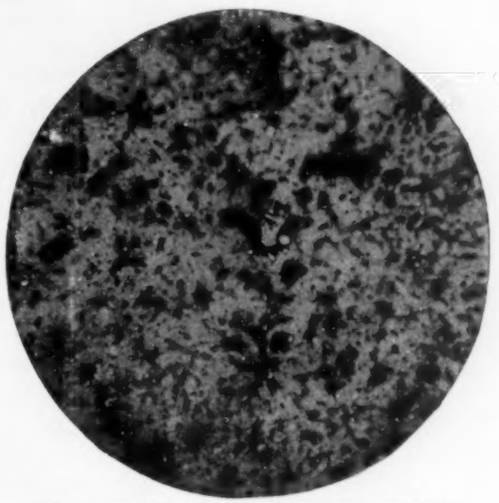
We would call attention to Fig. 2, compression chart of these various alloys made on the Olsen testing machine:

No. 8.—Elastic limit 23,000 lbs. per sq. in. Broke 91,850 lbs.

No. 7.—Elastic limit 31,000 lbs. per sq. in. Broke 80,800 lbs.

No. 6.—Elastic limit 19,500 lbs. per sq. in. Broke 76,400 lbs.

No. 5.—Elastic limit 15,000 lbs, per sq. in. Broke 57,000 lbs.



NO. A MAGNIFIED 45 DIAMETERS, ETCHED.

No. A.—Elastic limit 15,000 lbs. per sq. in. Broke 64,000 lbs.

The main points under consideration in this discussion are: Is Allan No. 1 metal the basis of this art? Can lead and copper, two metals that have little or no affinity for each other, be alloyed in all proportions, either with or without tin, into merchantable castings

NO. Aa MAGNIFIED 100 DIAMETERS, ETCHED.

by ordinary foundry practice and not exhibit "lead sweat" or segregation? Has the Ajax Metal Company established the following claim?

*Of Andrew Allan and Son, New York.
† Metal Industry, September, 1909.

From Reissued Letters Patent 12,880, we read:

"The invention therefore consists not in establishment of exact and rigid proportions, but in the discovery of the application of a critical relation between tin and copper required to make possible high percentage of lead."

Is this art based on how to control the lead?

In Mr. Clamer's paper of November he states:

Notwithstanding Mr. Allan's assertion to the contrary, it is a well established scientific fact that the critical point exists in the copper-tin alloy, where the proportions are approximately 91 per cent. of copper to 9 per cent. of tin.

I am not disputing the critical point in a copper-tin alloy, but I am disputing Mr. Clamer's claim of having established that this critical point bears any relation to a lead-copper-tin alloy to make possible high percentage of lead, and will prove that 9 parts of tin to 91 parts of copper is not the critical point in the sense that it affects the proportion of lead. The photo-micrographs shown herewith prove this.

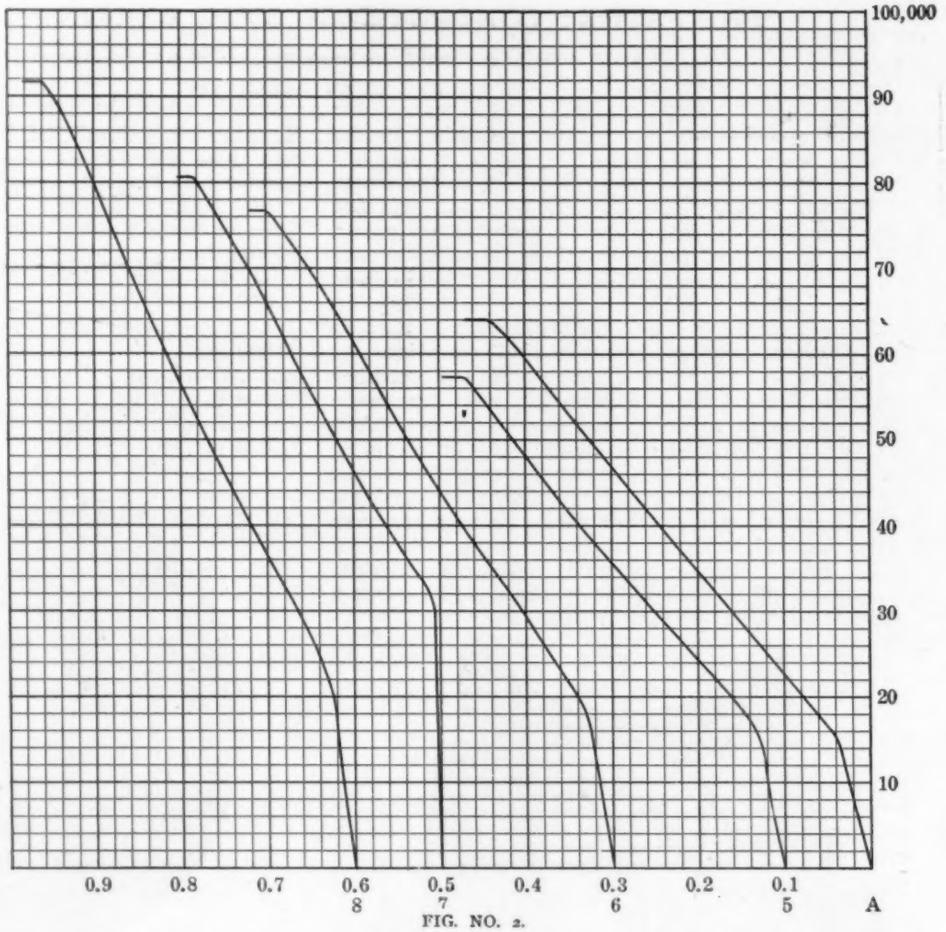


FIG. NO. 2.

Mr. Clamer states:

Andrew Allan, Sr., did not invent the series of alloys to which plastic bronze belongs.

Andrew Allan, Sr., invented the art of alloying lead and copper in any proportion with or without tin, an art that has not been accomplished by any other metallurgist to my knowledge.

Mr. Clamer states:

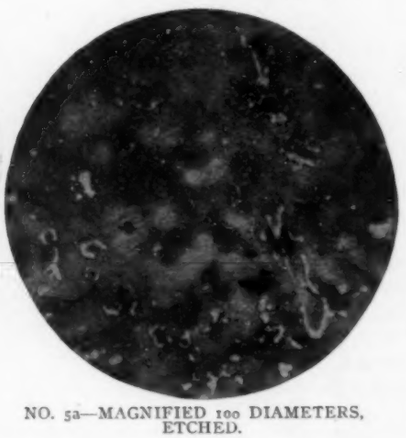
Let it be firmly understood that plastic bronze is a copper-tin alloy containing lead. Allan's metal is simply copper containing lead.

This is not quite correct. Allan No. 1 and No. 2 metals are mixtures of lead and copper; Allan Nos. 5, 6, 7 and 8 metals as shown here are mixtures of lead and bronze; plastic bronze is a mixture of lead and bronze, constituting in the first a matrix of copper and in the last two cases a matrix of bronze, all with inclusions of lead.

As to the relative value of our various lead-copper-tin alloys in comparison with plastic bronze, I do not care at this time to comment thereon, as we have under consideration the metallurgical rather than the mechanical side of the question:

Mr. Clamer states:

NO. 5, MAGNIFIED 45 DIAMETERS, ETCHED.

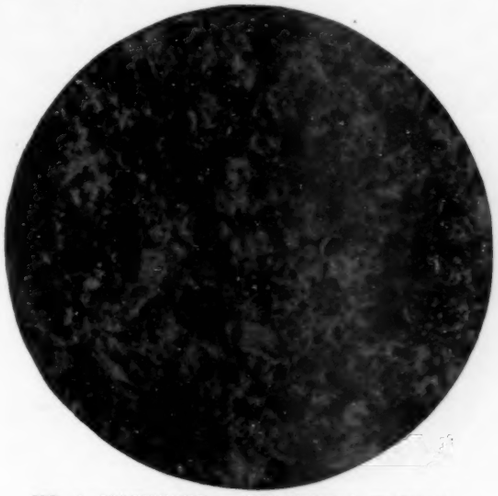


NO. 5a—MAGNIFIED 100 DIAMETERS, ETCHED.

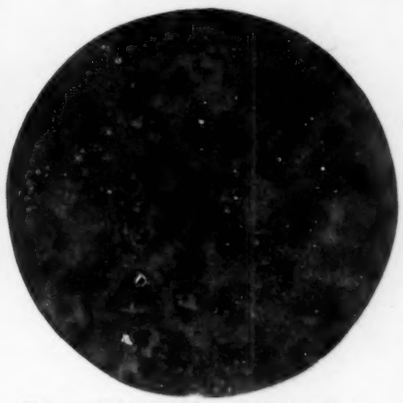
" . . . Lead dissolves but slightly in copper, and copper but slightly in lead, also there is no true eutectic mixture formed by the combination of these two metals, the copper in such an alloy being almost in an entirely free condition commences to solidify at the solidifying point of pure copper, i. e., 1,060 degs. Cent., and owing to the lead which is dissolved in it continues to solidify at a decreasing temperature until the temperature of approximately 954.5 degs. Cent. is reached, when the entire amount of copper solidifies with the small amount of lead which it holds in solution. At

this temperature there remains in a liquid condition, the almost pure lead, i. e., lead having in solution but a small percentage of copper, and this will not solidify until the temperature approximately that of pure lead is reached. Consequently, the strength of the alloy is limited to temperatures below this Mr. Allan's claim, therefore, that his alloy solidifies as a whole at 815 degs. Cent. is not correct."

Mr. Clamer seems to believe that the following paragraph taken from our No. 1 Bulletin is a very weak point. We agree with him:



NO. 6--MAGNIFIED 45 DIAMETERS, ETCHED.



NO. 6a—MAGNIFIED 100 DIAMETERS, ETCHED.

"The Allan metal is an application of lead as an anti-friction metal. Although it is well known that no metal possesses greater anti-frictional properties than lead, Allan metal is the only successful application of this metal, as it is sufficiently hardened to carry a heavy load, and its melting point has been raised to 815 degs. Cent."

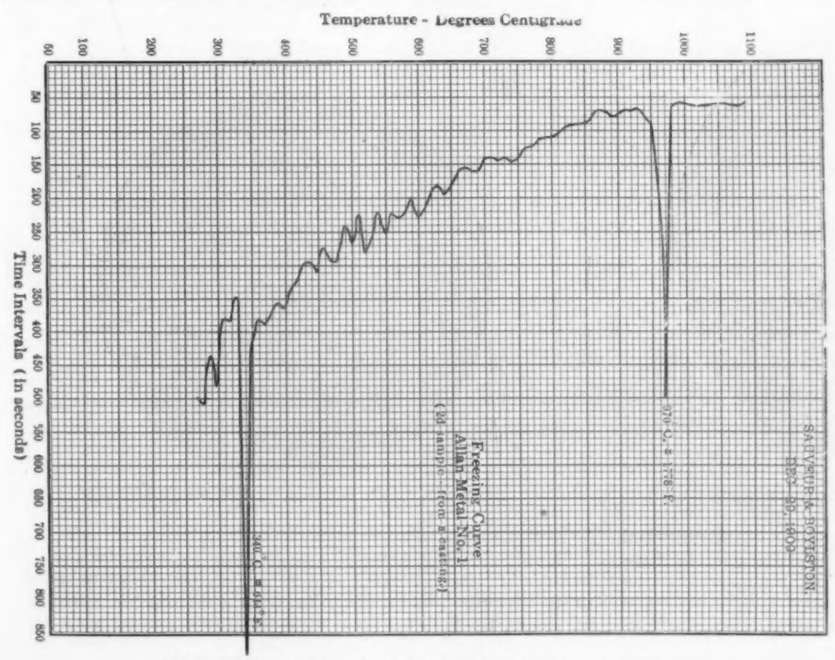
This quotation was never made with any attempt at deception, as our No. 1 Bulletin was published to explain the merits of our Nos. 1 and 2 metals in comparison with those of white babbitt metal. This 815 degs. Cent. was quoted to show that the Allan metals cannot be handled like white babbitt metal, but must be melted in crucibles like brass. Technically we did make a mistake in quoting 815 degs. instead of the proper casting temperature for Allan No. 1 metal, which is 1,149 degs. Cent.

I would call my readers' attention to the complete freezing curve of our No. 1 metal, which was taken by Messrs. Sauveur and Boylston, metallurgical engineers, who I believe, and as Mr. Clamer will probably agree, are excellent authorities.

On inspection of this curve the reader will note that it exhibits two well-marked critical points, one in the vicinity of 970 degs. Cent. and the other in the vicinity of 340 degs. Cent. It is evident that solidification proceeds in two distinct steps: The copper constituent begins to solidify at about 980 degs. Cent., and does not, as Mr. Clamer states, begin to solidify at 1,100 degs. Cent. The lead constituent begins to freeze at about 360 degs. Cent. and is completely solid at 330 degs. Cent. 980 degs. Cent. is the liquidus point of Allan No. 1 metal and also of the copper constituent, and is not, as Mr. Clamer states, 1,100 degs. Cent. 950 degs. Cent. is the solidus point of the copper constituent, 360 degs. Cent. is the liquidus point of the lead constituent, and 330 degs. Cent. the solidus point of the lead and also of the alloy. Between 950 degs. Cent. and 360 degs. Cent. the alloy is composed of particles of solid copper (containing a little lead) and of melted lead (containing a little copper).

Mr. Clamer states:

Allan's metal consists . . . of a network or matrix of copper and pools of lead. The photo-micrographs displayed by Mr. Allan in the September number of THE METAL INDUSTRY, although he evidently is of the opinion that they prove his claims that his alloy is in reality like one metal, on the contrary prove quite the reverse and confirm the statement as made by me that it is not a uniform mixture in the sense that it is like one metal. Although his photo-micrographs are but magnifications of sixty-five diameters, they distinctly show the matrix and pools of lead.



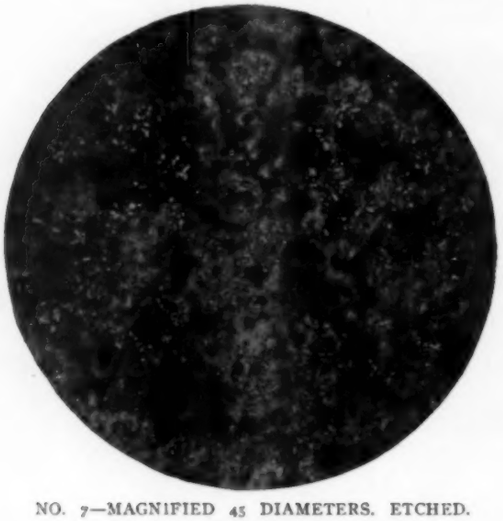
COMPLETE FREEZING CURVE OF ALLAN NO. 1 METAL.

Practically no alloys in the scientific sense are homogeneous unless their constituents form a series of solid solutions or chemical compounds and are in the ratio of these compounds.

Allan metals were called and are homogeneous in the sense that castings of them do not show segregation or "lead sweat" and commercially are actually like one metal. Any of our alloys can be produced in castings of any size without "lead sweat" or segregation, a feature which cannot be accomplished by

ordinary foundry practice, e. g.: Bricks are homogeneous, yet they are composed of sand and clay, but bricks containing large pebbles could hardly be called homogeneous.

At this point I would like to forcibly impress upon my readers that it is absolutely unnecessary to keep stirring Allan metal while casting in order to assist in preventing segregation. One can cast any number of molds with any of our alloys and positively not have to once stir the metal during the cast. When pouring Allan alloys the only need of a skimmer is to hold back



NO. 7—MAGNIFIED 45 DIAMETERS. ETCHED.

any dirt that tends to flow into the molds and not for vigorous stirring between the casts in order to assist in keeping the metal from segregating.

Mr. Clamer states:

"As I stated in my previous communication, copper and lead can be held in fairly uniform condition in a casting without re-

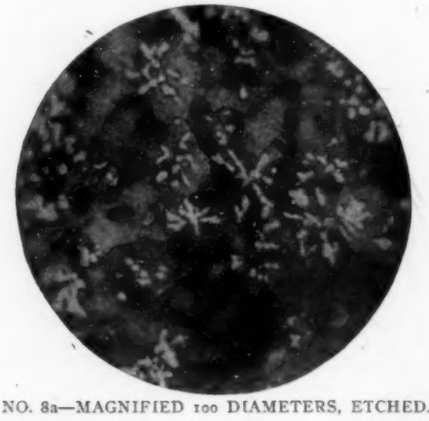
NO. 8—MAGNIFIED 45 DIAMETERS, ETCHED.

sorting to other than ordinary foundry methods of melting and pouring, and I am confirmed in this by Mr. Vicars in the September number of THE METAL INDUSTRY. In fact, any one who cares to prove my assertion can do so without difficulty. The only precaution necessary is to pour at as low a temperature as possible to run the metal. When so cast no pools of lead will segregate to the bottom of the castings, or to use a shop expression, they will not show 'lead sweat.'"

For over eighteen years we have been commercially manufacturing the Allan metals and I feel that I have quite a good idea of what can be accomplished in this art by ordinary foundry practice. I have come across many substitutes for Allan No. 1 metal, but can conscientiously say that I have yet to see merchantable castings of 50 per cent. lead and 50 per cent. copper other than those produced by us. From my experience I can positively state that by ordinary foundry practice alloys of 50 per cent. lead and 50 per cent. copper cannot be produced without segregation or "lead sweat," and I have yet to see a strictly lead-copper-tin alloy containing over 25 per cent. lead that will not exhibit "lead sweat," other than those alloys produced by our process.

NO. 7a—MAGNIFIED 100 DIAMETERS, ETCHED.

In the State of Pennsylvania there are many mill pinion bearings in service babbitted with Allan No. 2 metal, an alloy of 60 per cent. lead and 40 per cent. copper. These bearings required 1,000 lbs. to the cast, which was poured into the steel shells direct from the crucible. It is hardly necessary for me to comment on the service these bearings have to perform and the qualities a metal must possess to meet the conditions. Which positively cannot be accomplished by ordinary foundry practice.



NO. 8a—MAGNIFIED 100 DIAMETERS, ETCHED.

Mr. Clamer states:

"Messrs. Haycock and Neville in their paper which they read before the Royal Society of London in 1903, describe an elaborate investigation as made by them covering the constitution of copper-tin alloys. This work up to the present time stands undisputed and has been accepted by the most prominent experts in metallurgy. Messrs. Haycock and Neville are both fellows of the Royal Society and scientists of high standing."

Messrs. Haycock and Neville are eminent authorities. I recognize their high standing as scientists. Mr. Clamer seems to be laboring under the impression that I wish to break down their valuable copper-tin freezing point curves and microscopical examinations. I have no such intentions, but rather with the assistance of these eminent authorities and my photomicrographs herewith shown, prove that the Ajax Metal Company has not established that the critical relation between tin and copper is required to make possible high percentage of lead on which they base patent rights.

I call attention to Fig. 3, which sets forth in detail the equilibrium diagram of the series of copper-tin alloys established by Messrs. Haycock and Neville. If the reader will note, about the liquidus curve ABCDEFGHIK all the alloys are liquid. Between the liquidus and the solidus curve AblcdefE$_2$E$_3$H H"1K the alloys are partly liquid and partly solid. It will also be noted that a 9 per cent. tin alloy has a greater freezing range, b to b$_2$, than a 15 per cent. tin alloy,

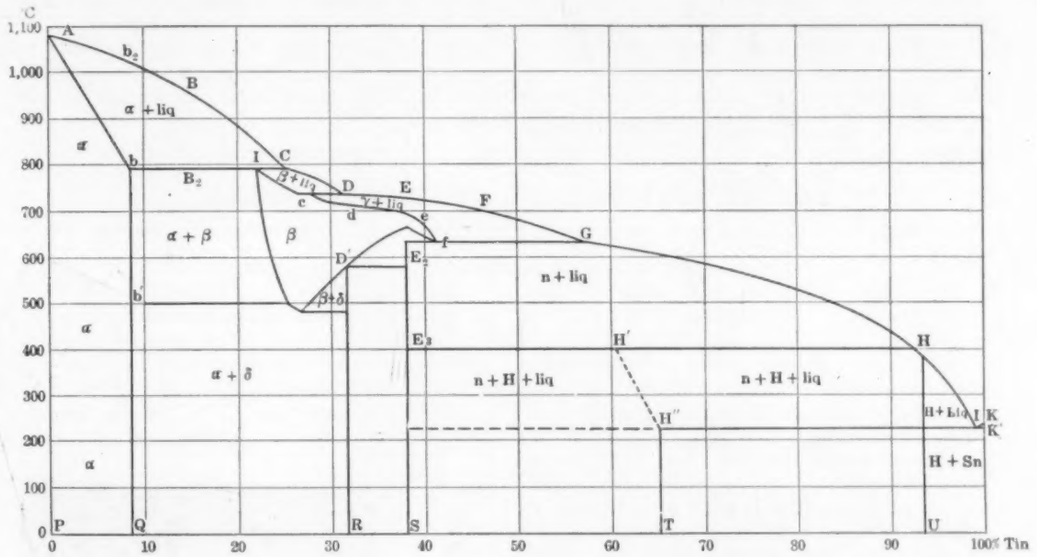


FIG. NO. 3.

which has a much shorter freezing range, B$_2$ to B. Therefore the 9 per cent. tin alloy must allow greater segregation of lead. This critical point can therefore only affect the bronze constituent and has nothing to do with the control of segregation of lead.

Mr. Clamer calls attention to pot metal. It is hardly necessary for me to comment on this mixture, my readers being perfectly familiar with this metal and its merits.

I am well aware of the fact that such metal can be produced by ordinary foundry practice by resorting to pouring at a low temperature, stirring vigorously and cooling rapidly in order to prevent "lead sweat," yet, in my opinion, it could hardly be called a mixture in the foundry sense, but what I would term an alloy stuffed with lead.

Mr. Clamer states:

"If at this late day Mr. Allan attempts to extend the scope of his invention to cover plastic bronze, he is simply expressing his own evidently and necessarily prejudiced opinion against that of the U. S. Circuit Court and an U. S. Circuit Court of Appeals, both of which reviewed the exhaustive testimony discussing the relationship of these various alloys."

Since the United States Circuit Court of Appeals for the District of New Jersey, at the October term, 1907, have handed down a decision in favor of the defendant, Brady Brass Company, of Jersey City, N. J., declaring letters patent 655,402 to be invalid, I am not considering said letters patent, but am questioning the validity of letters patent 12,880.

My entering this controversy has in no way been prompted by mercenary motives. My whole aim has been to establish my claim that Andrew Allan, Sr., is the inventor of the art of alloying lead and copper in any proportion with or without tin and also to advance the knowledge of this art as a whole. The alloying of our products shall, as in the past, be governed by the needs of our trade and will comprise lead and copper with and without tin in proportions as we deem advisable to meet any particular service conditions.

Mr. Clamer states that "in all probability" our process "consists of the addition of a small percentage of sulphur and bismuth."

If any of our alloys show on analysis the presence of any metal, other than lead, copper and tin, they are impurities and play no part in the compounding of our mixtures. With reference to sulphur, same does enter into our process, a fact which many manufacturers appreciate and endeavor to profit by.

In the August issue of THE METAL INDUSTRY Mr. Clamer calls attention to our "decrying" the use of tin in a bearing metal because of its adhesive qualities.

I would like to cite a case in support of our "decrying" the use of tin:

In the construction of Curtis steam turbines it was found that owing to speed, high temperature and the absence of lubrication, a metallic shaft packing was impossible and carbon packing was adopted as the standard. Within the past year three of the four 5,000 K. W. Curtis steam turbines at the Port Morris power station of the New York Central & Hudson River Railroad have been equipped with shaft packing made of Allan No. 1 metal.

This packing is giving excellent service. The diameter of the shafts is 16½ in., speed 500 r. p. m., temperature 527 degs. Fahr. and no lubrication. I feel that a metal by meeting these conditions gives ample reason for our "decrying" the use of tin where an

exceptionally high grade anti-friction metal is required.

I call attention to photo-micrographs collectively. The reader will note that they all in common exhibit black spots—lead, white—Cu_2 S, copper sulphide and groundmass bronze, but in the Allan alloys shown there is an addition to the above dark flakes Cu_4 Sn-Eutectoid.

The question now arises: In the series of Allan alloys shown there is a Eutectoid. What is the effect of this Eutectoid on the service qualities of the alloys? It merely hardens the groundmass and does not affect the liability of the lead to segregate in Allan metals. The presence of the Eutectoid has this bearing on the subject under discussion. That it wholly disproves that a critical point has been established between tin and copper which is necessary to make possible high percentage of lead.

The presence of the Eutectoid of Cu_4Sn shows that the critical point of the copper-tin series has been passed—and as merchantable castings can still be made, the critical point of the copper-tin series can have no bearing on the lead content of the alloy. As to the service qualities of our various lead-copper-tin alloys, I will not comment thereon at this writing.

In conclusion I wish to state that the successful application of this art to produce merchantable castings that will not exhibit "lead sweat" or segregation cannot be accomplished by ordinary foundry practice.

This art is based on alloying lead and copper, two metals that have little or no affinity for each other, and all lead-copper-tin alloys high in lead are the outgrowth of a lead-copper alloy, which is the base.

Mr. Clamer has not established the critical relation between tin and copper required to make possible high percentage of lead on which he bases patent rights.

This whole series of alloys depends upon how to control the lead, and not upon the exact proportion of 9 per cent. of tin to 91 of copper in the mix, nor is it necessary to use tin to assist in preventing segregation.

Photo-micrographs shown of a few of our alloys the reader will note are all above 9 per cent. of tin to 91 per cent. of copper. This series is shown because by Mr. Clamer's patent claim they are impossible alloys.

Throughout this controversy I have endeavored to confine my remarks within due bounds and I have been moved by absolute faith in my convictions. I want my readers to bear in mind that I have no desire to cast any reflections upon Mr. G. H. Clamer and his associates, and while my remarks may seem to be a little forcible they are only directed to prove why I differ from Mr. Clamer on this metallurgical question.

LATEST APPLICATIONS OF "MONEL METAL."

RELATING TO THE RAPID DEVELOPMENT OF THIS NICKEL COPPER ALLOY METAL.

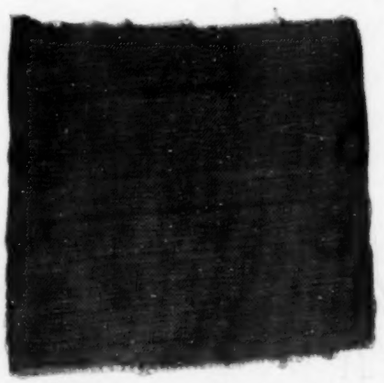
This natural alloy of copper and nickel is so rapidly coming to the front as an important metallic factor, that when a new application for it is announced it occasions little if any surprise. Some of the uses which the metal has been put, and with which the public is familiar, are for the manufacture of acid resisting and non-oxidizing tube wire and sheet and castings. Tons of "Monel metal" in the form of sheet have been used on the roof of the Pennsylvania railroad terminal station at 34th street, New York City, and for similar buildings in various parts of the country. A large quantity is used in the shape of wire for electrical purposes in the manufacture of heating appliances requiring low conductivity. The use of "Monel metal" for the manufacture of propellor blades* and the like for salt water use is too well known to dilate upon here. "Monel metal" pipes and tubes for use where corrosive acids and liquors are employed is now in general operation and some remarkable results have been obtained.

Perhaps the latest application of "Monel metal" is for the manufacture of wire cloth for window and door screens, and also as a non-corrosive material in the production of paper and artificial silk. For window and door screens "Monel metal" has no equal; while the first cost may be somwhat greater than copper or bronze, its superiority as to long life more than makes up the difference.

The small cut here shown represents a piece of "Monel metal" wire cloth, made with 180 holes to the quare inch, finer than any pocket handkerchief! This cloth is used in the making of artificial silk and has proved to be the only efficient material yet employed. The material in use before the advent of "Monel metal" resisted the action of the solution for a matter of a few hours, while the life of the new cloth is considerably greater.

It has been suggested that "Monel metal" be employed by the government for coins and in this case it would lend itself admirably, for it rolls, draws and takes a sharp impression as well, if not better, than any of the metals now in use. The government has already adopted "Monel metal" as one of its standard metals and the specifications for its use are as follows:

Chemical composition of "Monel metal" to be not less than 60 per cent. nickel and the balance copper,



MONEL METAL CLOTH, 180 HOLES TO SQUARE INCH.

other elements in small percentage without being detrimental to its physical qualities.

Navy mixture No. 1, for rods, tubes, and similar material.

Minimum tensile strength per square inch, 80,000 pounds; minimum elastic limit, 50,000 pounds; minimum elongation in 2 ins., 20 per cent., and to stand cold bend of 180 degs. about an inner diameter of 1 in.

Navy mixture No. 2, for castings and similar material.

Minimum tensile strength per square inch, 60,000 pounds; minimum elastic limit, 35,000 pounds.

*THE METAL INDUSTRY, January, 1909.

HIGH SPEED PRODUCTION IN THE BRASS SHOP.

By Edflemm.

(Continued from January.)

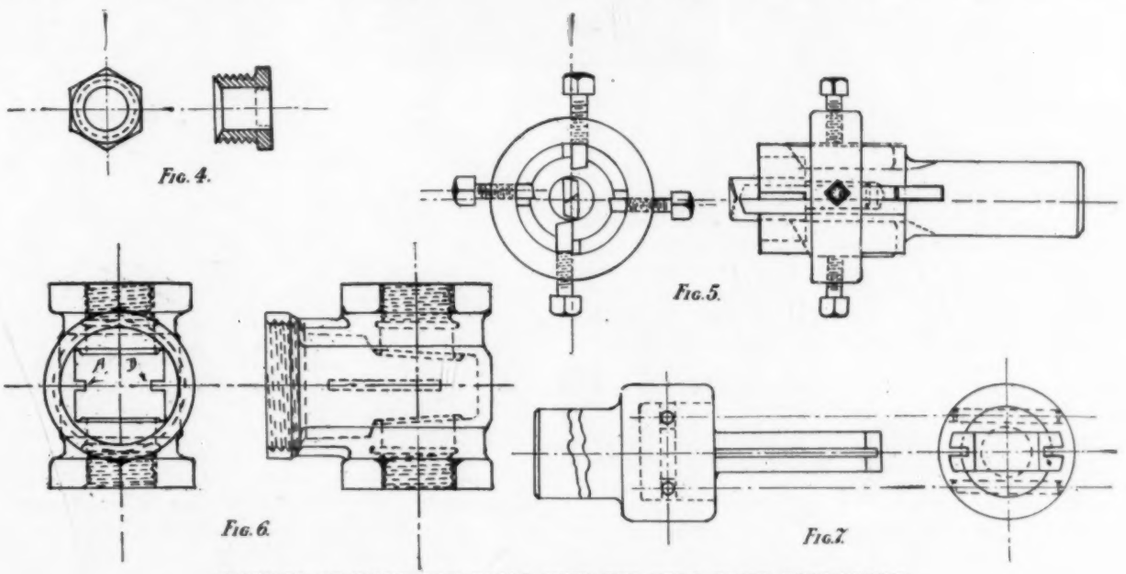
In the last number we treated on inserted blade boring tools and taps. It is natural to follow with inserted blade turning tools, which are in a sense only inverted boring tools. In Fig. 4 is shown a packing gland nut for use on a valve. This nut is made from a casting and held in an air chuck while finishing thread diameter, boring and beveling packing end. These three operations are performed by one tool with one movement of the turret. The tool required to accomplish these three operations simultaneously is shown in Fig. 5. Careful examination will show the ease with which it is accomplished without complications, as each cutting edge is independent of the other in its adjustment.

For the most economical production of brass goods the elimination of handling operations, or, in other words, the avoiding of changing from one machine to another to complete a piece is exceedingly desirous. It is oftentimes possible to perform a milling operation on a turret lathe as, for instance, in the following example. Fig. 6 shows a gate valve body and in ordinary shop practice it is customary to finish the bonnet and pipe ends and then carry to a broaching press and mill or broach the guides "A"—"B." These guides come cast as close as possible to size, but it is necessary to run a tool over same to clean up any burrs or fins there might be on them. In Fig. 7 is shown a tool which permits of broaching these guides while in the turret lathe for threading bonnet end.

In operation the operator brings his lathe to a full stop and then advances his turret, carrying broaching tool, and with his free hand revolves the broaching tool to register with the guides and then forces same over them when they are brought to size and finish desired. In making this tool it is necessary to use care in relieving cutting edges and make allowance for regrinding. The cost of finishing these guides in this matter is less than the cost of getting work from one machine to the other, to say nothing of the cost of the operation after work is brought to the other machine.

In figuring ways and means for reducing costs, one is apt to overlook the large amount of time that can be saved by combining such operations as is shown in the above illustration. The saving in labor is not the only advantage, as for instance in many cases it means increased production from smaller investment of machinery, consequently a reduction in the overhead charges of a shop from reduction in power bills and money tied up in machinery, and consequently there is a smaller amount to write off for depreciation that has a direct bearing on shop expense burden.

(To be continued.)



SAMPLES OF WORK AND TOOLS USED FOR HIGH SPEED PRODUCTION.

A NEW WHITE METAL WITH ALUMINUM.

The "Rigasche Industriezeitung" publishes the composition of an alloy for pedestals for which it is claimed that it is not only superior and more lasting than other alloys for the same purpose, but also preferable to bronze. The metals forming the alloy are as follows:

Copper from ...	0.40 to	1.25%,	best proportion	1.20%.
Tin from.....	10.0 "	15.0 %,	" "	12.0 %.
Lead from	0.60 "	0.85%,	" "	0.80%.
Antimony from.	6.0 "	20.0 %,	" "	14.0 %.
Aluminum from.	15.0 "	35.0 %,	" "	35.0 %.
Zinc from	30.0 "	55.0 %,	" "	37.0 %.

The alloy is prepared as follows: The copper is melted first and the other metals are afterward added one by one. After the addition of each metal the mixture must be thoroughly stirred with an iron rod and the heat should be gradually reduced. Toward the end of the operation a willow stick should be used instead of the iron rod for stirring, as it is claimed that this will not only produce a more homogeneous mixture but will also influence the quality of the alloy.

The above table gives the best composition for general use, and also the proportions within the limits in which the alloy can be compounded for special purposes.

It is also much more homogeneous and tougher than either pure Aluminum or the alloys hitherto used. This new metal should, therefore, be more useful for dirigible balloons and aeroplanes.

THE FAILURE IN PRACTICE OF NON-FERROUS METALS AND ALLOYS*

With Particular Reference to Brass Loco-Tubes.

By T. Vaughan Hughes, A. R. S. M., F. I. C.

Believing that the welfare of the Institute of Metals will in some measure be promoted should members from time to time contribute short papers on abnormalities or "breakdowns" in those metals and alloys which come under their purview, the author ventures to bring this brief notice before the Institute with the consent of the parties for whom the investigation was originally made, and to whom he tenders his thanks. Having exhausted all the usual methods of investigation into the cause of the frequent bursting of the brass loco-tubes, which form the subject-matter of this paper, the engineer and managing director considered that further enlightenment was necessary, and the author was instructed to endeavor to discover the cause of repeated disasters which had ended in serious casualties and highly expensive Government inquiries.

T. VAUGHAN HUGHES.

EXAMINATION OF CORRODED TUBING.

The first tube submitted to the author was received in two parts, the larger 3 feet 5 inches and the other 2 inches over all. The pieces fitted one another along a line of fracture. The tube had been externally scraped and wiped so that the metallic surface on the outside was exposed. A working pressure of 160 lbs. per quare inch was carried in the boiler in which the tube was fitted.

The outside of the tube in contact with the boiler water was quite free from corrosion of any kind. The inference is that the boiler water was free from substances capable of corroding the alloy (70/30 brass) of which the tube was composed.

No part of the exterior of the tube exhibited evidence of having been "burnt," i. e., over-heated and oxidized. The inside, however, was much corroded from end to end—the greatest corrosion had taken place near the fracture, which, in place, lay nearest the firebox. The walls of the central and least corroded portion of the tube were 0.1 inch thick. About the area of fracture the least measurement gave a thickness of only 0.038 inch. The whole of the interior of the tube was coated with a lightish-green salt, practically insoluble in water, but easily in dilute sulphuric acid. A further investigation of this salt scraped from the interior led to the conclusion that it was mainly composed of mixed basic sulphates of copper and zinc.

After removing the green coating by dilute sulphuric acid a dark-red "scale" appeared, formed of cuprous oxide. Examined under a high magnifying power, this layer of oxide was permeated with the light-green salt referred to. So far it is reasonable to infer that the cause of fracture of the tube under working pressure was due to—

(1) Corrosion proceeding from the inside towards the outside of tube.

(2) That the tube has not been "burnt," i. e., overheated and oxidized, as cupric and zinc oxide were absent in the "scale" and salts.

After sawing the tube longitudinally and opening, it was observed that the corrosion was not continuous throughout the length of the tube, being more marked at the ends, and particularly at the firebox ends, and on one-half of the inside circumference. An exhaustive microscopical examination (1-inch lengths) of the tube, longitudinally and transversely, was made. The crystal grains were found to be larger at the ends than in the middle parts.

About the area of fracture the crystal size was equivalent to that produced by maintaining a 70/30 brass of equal dimensions at a temperature of 700 degrees Cent. for about ten minutes. The crystal size at the end farthest removed from the fracture was smaller, resembling that of an equal dimensioned piece of brass heated for ten minutes at 700 degrees Cent. The central portions of the tube were normal, both longitudinally and transversely, proving that one tube had been annealed at about 600 degrees Cent. A peculiarity of the crystals at the seat of breakdown lay in the fact that they were uneven. Those nearest the fracture were much larger than in an area 90 degrees to 180 degrees from it. The boundaries of the largest crystals were corroded, and embraced intrusions of cuprous oxide.

Obviously, then, the tube as supplied by the makers was passable as a commercial production. Slight overheating had taken place at the ends of the tube—possibly for expanding purposes. Abnormal overheating, however, had occurred near the fracture, which, as explained above, abutted the firebox. As the temperature of the water due to the boiler-pressure used was about 360 degrees Fahr., it might have been advisable to anneal the tube in process of manufacture at as low a temperature as possible. However, the manufacturer is not to blame here, as large crystal grains would have been formed in other portions of the tube had it been unevenly or overannealed in the mill. The overheating had taken place after the tube left the manufacturer.

A chemical examination of the coke used as fuel proved it to contain 0.89 per cent. of volatile and 0.37 per cent. of sulphur fixed in the ash. Such a coke would supply all the sulphur necessary for bringing about above results. The inquest on the tube so far has shown that by overheating of the ends of the tube, particularly the firebox end, the grain structure has been so enlarged that incipient disintegration has taken place—that is, the texture has been enlarged, and the crystal boundaries become permeated with films of lower oxides, thus undermining the strength of the alloy.

CONCLUSIONS BASED UPON THE EXAMINATION.

Can the abnormal corrosion be explained? A word or two anent the method of working the boiler. Steam blast was used for producing draught. As coke was the fuel, the interior of the tubes would be subjected to intermittent streams of hot gases containing gaseous sulphur compounds—carbon monoxide and dioxide.

*Paper read at Annual General Meeting, Institute of Metals, held at Westminster, London, England, Jan. 18th, 1910.

The proportion of the latter gases would depend on the size and volume of the fuel in the grate.

Two alternative explanations appear applicable. The first may be called shortly a "low temperature" theory. Allowing the ends of the tube to have become overheated—the evidence shows them to have attained a temperature much above the melting-point of zinc—it is reasonable to conclude that the zinc on the surface layers of the interior of the tube had evaporated. A similar result is brought about when rolls of hard brass are subjected to a prolonged annealing in a reducing atmosphere at a temperature about the melting-point of zinc.

As the hot gases passing though the tubes consist chiefly of nitrogen—carbon dioxide and monoxide—the latter would tend at times to maintain a reducing atmosphere and cause cuprous oxide to be formed rather than the higher oxide. The joint action of steam and sulphur dioxide, evolved when the fires were made in the morning or at intervals during the day, using damp coke, coming in contact with the cooled cuprous oxide covered surface, condense and react, especially if a little cupric oxide was also formed. Thus arise the sulphates—basic in character, as above investigation shows. The cuprous oxide layer being meshed suggests such formation as following evaporation of one constituent of a crystalline mass. The sulphates being once formed, repetition of the combined actions would cause the corrosion to continue until breakdown of the tube occurred at the firebox end where the reactions would be most pronounced.

The second may be shortly referred to as a "high temperature" theory. The evidence shows the tube in certain parts to have attained the temperature of about 800 degrees C. Interaction between the hot carbon monoxide, gaseous sulphur compounds, and the copper and zinc of the tube could take place. The tendency would be to form cuprous oxide in view of the metallurgical action of cupric oxide, reducing gases and sulphur compounds under the conditions obtaining.

This cuprous oxide would appear to be the vanguard of the attack. The cooler and moist sulphurous gases generated after stoking wet fuel on to the grate would be the rearguard and form the sulphates referred to above.

There was no evidence of carbonates in the green incrustation. The heating and cooling of the fire-grate would take place several times a day under special conditions of traffic. This occurred regularly on two sections of the route in a fifteen-minutes' service. At the top of two gradients of 1 inch 17 to 20 the locos were brought to a standstill for steam-raising purposes. It appears to have been the habit of the stoker to charge damp coke on to the white-hot bed of fuel in the grate during these stoppages. Thus the cooling and formation of large volumes of carbon monoxide can be accounted for.

The evidence of the contemporary presence of the basic salts of copper and zinc, and particularly of the layer of cuprous oxide in contact with the tubes, negatives the theory that the bursts of the tube followed corrosion of the alloy by impacts of particles of coke and ash, induced by the steam-blast. As stated above, the tube submitted for examination had been externally scraped and wiped. On close inspection a chocolate-colored film could be detected in places.

As the author was not satisfied with the cause of the overheating of the tubes—and as the ends presumably had been expanded in the cold and no reheating of any kind resorted to in the loco-shed when fixing new tubes in the boiler—he advised further investigation; and as a result several tubes from the same boiler were sent for examination. They were delivered to the author neither scraped nor wiped. The tubes were externally covered from end to end, where in contact with the boiler water, with a chocolate-colored deposit, even and bright.

The average thickness of this covering was about 1-10 millimetre. In order to avoid contamination with iron, and to reduce as much as possible admixture of the scrapings with abrasions of the tube itself, a hard copper scraper was used.

On scraping it was noticed that the deposit was formed in a series of layers. The innermost, or that nearest to the metal of the tubes, was almost black and very compact. In hardness the chocolate-colored deposit resembled that of talc. The innermost layer required considerable force to remove it. In fact it resembled, in general characteristics, a hard varnish. By scraping a large number of tubes, similar in all respects as to the amount and character of deposit, sufficient for a fairly exhaustive analysis was obtained.

A preliminary test proved that up to 100 degs. Cent. moisture only was dissipated from the material. Consequently the bulk was heated at 100 degs. Cent. until constant in weight. A portion of this was extracted with water. The extract yielded chloride and sulphate of lime only. The dried portion was extracted with alcohol. This rendered a soap containing iron, alumina, and magnesia as bases.

The residue after the alcoholic extraction was then extracted with dried ether. On evaporating, a grease fluid at ordinary temperatures, was obtained. At a later date several pounds of this chocolate-colored deposit were procured. On more extended investigation this grease proved to be a heavy, mineral hydrocarbon. Such is used as a cylinder lubricant. The locomotives from which the tubes were removed were broken up a year or two ago. The author has recently been informed that a quantity of cylinder oil was found in the water-tank, having found its way there by the carelessness of the attendants.

The doubly extracted dry residue was subjected to analysis.

In the first place it was incinerated in a stream of purified oxygen and air by the ordinary methods of organic analysis.

Weights of carbon dioxide and water were obtained: the former calculated to carbon in carbonaceous matter (as there was not the slightest trace of carbon dioxide apparent on heating the dried substance with dilute acids); the latter assigned to combined water and hydrogen in combination with the carbon most probably.

ANALYSIS OF THE RESIDUE.

The residue after combustion was submitted to analysis with results given below:

	Per Cent.
Loss at 100 degs. Cent., i. e. moisture	2.80
Matter soluble in water (chloride and sulphate of lime)	1.65
Alcoholic extract (a soap containing iron, alumina, and magnesia)	1.34
Ether extract (rendering a grease fluid at ordinary temperatures)	0.50
Carbon as carbonaceous matter	5.98
Combined water and hydrogen	15.59
Silica	19.21
Magnesia	16.77
Ferric oxide	13.23
Copper	8.18
Zinc	8.35
Alumina	2.41
Lime	2.45

	Per Cent.
Sulphuric acid (as SO_4)	1.85
Phosphoric acid (as P_2O_5)	0.32
Chlorides	trace
Alkalies	nil

A few observations on the above analysis are desirable. No salts of either copper or zinc were found in any of the extracts.

A proportion of zinc appears to have been present as basic sulphate. A proximate analysis on a very small quantity led to the conclusion that a portion of the copper found was present in the deposit as an oxide. The balance of the copper and zinc approached the composition of the tube (70/30 brass), indicating that scrapings of the tube itself had become admixed with the sample of "scale."

The brass fittings on the boiler might account for some of the copper and zinc. The carbonaceous matter (5.98 per cent.) is apparently that derived from the carbon in the innermost varnish-like layer. There were no carbonates in the "scale," nor were there carbonates formed when the extracted deposit was calcined in the air. Over thirty measurements of the thickness of the "scale" were made. They gave an average of 0.09 millimetre—the maximum being 0.11 and the minimum 0.07 of a millimetre.

It was thought that a measurement of the electrical resistance of this deposit would give some indication of its heat conductivity. Consequently the coating on a dry tube was subjected to an electromotive force of 250 volts. The electrical resistance offered by this coating was 20 megohms. Several measurements were made before the tubes were scraped, with as nearly as possible the same result. When the coating was damped by a drop of water where one electrode touched it, the resistance fell to 150,000 ohms only.

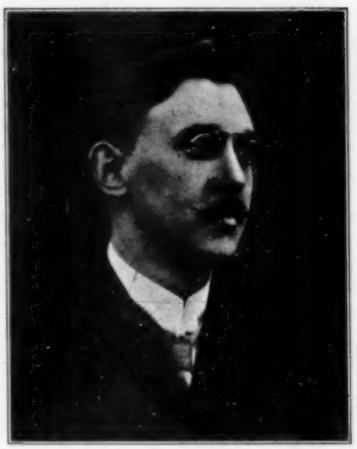
The test is instructive as indicating that even when damp and cold, the coating forms an excellent non-conductor of electricity and we may reasonably conclude of heat also. Since the above investigation was completed several pounds of a chocolate-colored, frothy mass were obtained from stays and bracings in the same boiler. The stuff contained a total of 6 per cent. of organic substances extracted by alcohol and rectified petrol. The peculiar nature of the deposit on the tubes, the author believes, is sufficient to account for the overheating referred to in this paper, and for the corrosion ending in explosion. In this instance we have shown that the material has broken down in the hands of the user and not by any aberrations on the part of the maker.

It is noteworthy that the boilers from which the tubes were taken, and others in which similar accidents occurred, were fed with the untreated water supplied under the Birmingham Welsh Water Scheme. The author is informed that abnormal breakdowns in the loco-tubes did not occur when the old supply was used for feed-water.

THE ANALYSIS OF ALUMINUM AND ITS ALLOYS.*

By Richard Seligman, Ph.Nat.D., and F. J. Willott.

Now that aluminum is rapidly becoming one of the common metals, it is highly desirable that everything appertaining to it should be standardized as soon as possible. Much work is in progress which will tend to bring this end about, but there is still a great deal to be done in this direction. One of the cases where we ourselves have often felt the want of uniform practice among those who deal with aluminum, has been that of the analytical methods to be applied to the metal and its alloys, and it has seemed to us that if all the users could be induced to adopt a standard method, some of the difficulties which we have from time to time encountered would be removed.



F. J. WILLOTT.

Our analytical work has been mainly commercial, so that the methods which we shall describe will be for the most part the rapid methods of the industrial laboratory, and are designed to give only that degree of accuracy which the industry demands. We propose to deal first with the pure metal, and subsequently with the more common of the aluminum alloys.

IMPURITIES CONTAINED IN "PURE ALUMINUM."

The vast majority of the aluminum of commerce contains as impurities silicon, iron and sodium, together with minute traces of carbon, oxygen and nitrogen, which have scarcely been determined with satisfactory accuracy. The products of some factories also regularly carry small amounts of copper, derived, no doubt, from certain parts of the furnace equipment used in the manufacture of the metal. In the following table (I.) a few characteristic analyses are given, which show the proportions in which these impurities usually occur in commercial aluminum. It will be seen that the relations between the chief ingredients vary in the products of various factories, although the total amount does not differ appreciably.

GENERAL REMARKS AS TO THE METHOD USED.

In analyzing aluminum, we have for a long time renounced the idea of determining the proportion of the metal itself, owing to the great difficulty of estimating the latter with any approach to accuracy in samples containing as much as 99.5 per cent., or even over 99.75 per cent. of this ingredient, a proportion of which may be in the form of oxide. Although, as was pointed out by Professor Carpenter,* this is regrettable from a scientific point of view, from a practical standpoint it has not, up to the present, been of much importance. While it is true that an accurate estimation of the amount of aluminum would form a useful check on the determination of the impurities,

TABLE I.

	Extra Pure Metal.	Ordinary American.	Ordinary English.	Ordinary French.	Low Grade.
Silicon	0.20	0.4	0.3	0.4	0.7
Iron	0.15	0.35	0.4	0.3	0.6
Sodium	0.02	..	0.04	..	0.06
Copper	nil	0.1	nil	nil	nil

*Paper read at General Meeting Institute of Metals, Jan. 18, 1910.

*Proceedings of the Institution of Mechanical Engineers, 1907, p. 97.

it is the amount and relative proportions of the latter which affect the properties of the metal. Consequently we have usually confined our attention to the estimation of the impurities.

In most works it has become customary to curtail even this operation, and to determine only those impurities present in appreciable quantities, and to call the balance aluminum. Thus the grade of metal known as 99.5 per cent. will, in most cases, contain about 0.5 per cent. of silicon and iron, so that in reality it will only carry about 99.4 per cent. of aluminum. This innocent deception has doubtless been fostered by our general ignorance as to the influence on the behavior of the metal of the small quantities of impurities thus ignored; but it seems to us that, as aluminum comes more widely into use, opportunities which have thus far been wanting, of filling some of these gaps in our knowledge should present themselves, so that new and better methods of estimating the minor impurities will have to be devised.

ANALYSIS OF "PURE ALUMINUM."

Silicon.—Silicon appears to be present in aluminum in two, or possibly three, forms, viz. (1) combined as silicide of aluminum, or perhaps as an alumino silicide of iron;* (2) in the form of graphite silicon (the condition of this material appears to vary according to the treatment to which the metal has been subjected); (3) Kohn-Abrest states† that he has found considerable quantities of silica in the samples upon which he was working, although it does not seem certain to us that this silica was not derived from the combined silicon during the course of the analysis. As nothing is known at present as to the individual effect of these various forms of silicon on the properties of the metal, it is seldom found necessary to determine them separately, and the usual analysis consists in estimating only the total silicon.

Iron.—For the determination of the iron in aluminum we used the method first described by Regelsberger,‡ which we have modified only in details. Essentially this method consists in dissolving the aluminium in caustic soda, the iron in sulphuric acid, and in titrating with permanganate. In practiced hands it is very accurate, but careful attention to details is necessary if reliable results are to be obtained. Table II shows the concordance of the results of which this method is capable.

TABLE II.

Sample No.	1,	Iron per Cent.	=0.40, 0.41, 0.40, 0.40
"	2,	"	"	=0.33, 0.33
"	3,	"	"	=0.36, 0.36, 0.37
"	4,	"	"	=0.28, 0.29
"	5,	"	"	=0.35, 0.34

For this determination the nature of the turnings which form the sample is of importance, unduly coarse material giving low results, while excessively fine turnings, powder, etc., cause the solution to foam. With a milling cutter very satisfactory samples can be produced.

SODIUM.

For the determination of the sodium in aluminum we take advantage of the fact that aluminum nitrate is decomposed at a temperature of about 250 degs. Cent., giving insoluble alumina.

Copper.—The presence of large quantities of copper is detected during the determination of the iron as described above.

*Vigouroux, *Comptes Rendus*, 1905, vol. cxli. p. 951.
†*Loc. cit.*, p. 212.
‡Zeitschrift für angew. Chem., 1891.

ALLOYS.

Usual Composition.—The alloys of aluminum in common use contain, in addition to the ingredients already cited as impurities, copper, zinc, and nickel; more rarely magnesium, and as an additional impurity, lead. Alloys with tin are met with from time to time, usually in solders or soldered joints, while occasionally manganese, titanium, and tungsten have to be dealt with. For the determination of these ingredients the ordinary methods are usually applicable.

LARGEST SAXOPHONE IN THE WORLD.

The instrument shown in the cut is the largest of its kind ever made. It is composed entirely of brass and stands 6 ft. 7 ins. high and measures 16 ft. 4 ins. in length over all. The bell is 26 ins. in diameter, and there are 35 keys.

The saxophone was made by Evette & Schaeffer and M. M. Buffet, Crampon & Cie, Paris, France, for Carl

LARGEST SAXOPHONE EVER MADE.

Fischer & Company, importers and manufacturers of musical instruments, 6 Cooper Square, New York.

Two months were consumed in its manufacture and it was finally silver plated by Lesch & Farrell, New York. Twenty-six ounces of silver were deposited on the instrument itself and one ounce of gold for the inside of the bell. When it is realized that the valves and keys were a perfect fit before plating, it will be understood how difficult it was to carry the plating process to a successful finish as was done. The outside of the horn was satin finished and burnished gold on the inside of the bell.

GOLD AND SILVER IN WASTE MATERIALS.

Methods and Equipment Used in the Recovery and Reduction of Precious Metals from Sweeps and Other Waste Material.

By Frederick E. Healey.*

(Concluded from January.)

The Elspass mill is shown in Fig. 3 under actual operation, delivering into a Pierce amalgamator having 42 silver plated riffles. In some cases a settling box is built between the mill and the amalgamator and also an amalgam plate covered with a heavy blanket is placed between the amalgamator and the first settling tank. The Elspass mill consists essentially of a heavy revolving pan upon which rests four stationary rolls. These rolls press upon the pan to a degree as determined by powerful coiled springs which are set by the operator and regulated as regards the size of pieces fed under the rolls. The pan of the mill must be of specially selected steel and formed to prevent the depositing of amalgamated material. The screen shown around the rim of the pan can be made of any mesh desired and must be made removable. The size of the pan that is generally used allows of the installation of a screen having 22 feet of free surface: This screen is attached to and moves with the revolving pan. Just inside the screen there are fitted plows or sweeps which agitate

FIG. 3—ELSPASS MILL AND AMALGAMATOR PLANT, UNITED STATES MINT, AT DENVER, COLORADO.

the uncrushed material, force this material under the rolls and throw the ground pulp against the screen and act as a gigantic mechanical gold pan.

This wet method has been found to be much better than a method where Chilian mills are required, due to the fact that the ground pulp is forced to issue in a granulated form as soon as it is fine enough to pass through the screen, thereby parting the finely granulated product from the uncrushed material in the pan. If the pulp is continually reground the very fine particles mix with the greasy graphite scum and float away with the wash water. The water feed coming into the center of the pan allows of a centrifugal cleaning action and wets down all dirt and crushed material that is thrown into the hopper, thus doing away with the dry black lead dust which often damages the interior finish of the building and at the same time carries values that should be saved. A sweep cellar thus fitted and operated is as clean, in so far as the air of the room is concerned, as any machine shop would be.

THE SETTLING TANKS.

The settling tanks, which are generally built of steel, have a series of screens fitted across their short lengths and these screens should be removable and of such a mesh as can only be determined by actual experience as regards the pulp or material on which the mill is working and the time allowed for treating this material. Several settling tanks should be used. These tanks are fitted in series so that the wash water and slimes will pass through screens until the last delivery of wash water carries little value. It is considered best to have a settling tank or well constructed beneath the floor of the sweep room and to take the water supply, for wetting down the broken material that is fed into the hopper, from the settling tank. This settling well also will allow of the deposit of some mud that can be cleaned out, mixed with the mud that is supposed to be the richest and which is taken from the first settling tank and run through the mill again. The output of the mill plant is different for different materials, and if the mill is overloaded as regards the actual time required for treating, then the residue in the first settling tank should be run a second time through the mill. In cases where sweeps that are made up of wooden chips, ashes, broken firebrick and loam are fed into the mill, the pan of the mill should be cleaned of the wood pulp, nails and any metals or hard substances that will not amalgamate, every hour or so. Wood pulp thus recovered should be dried and reduced in a special furnace shown in Fig. 4.

If assays show that the residue in the settling tanks is worth selling to a smelter or a reduction company, then the residue should be thrown into a drying tank and allowed to solidify. The drying tank is generally made of steel plates and has a double bottom between the plates of which a steam coil is installed. Just before the residue becomes dry, or in a state that would cause a dust to arise when shoveling same, this mud should be sacked and piled ready for shipping from the works to the smelters. If the wet plant is operated as it should be, the values in the waste material from the settling tanks will be of such little value that the cost for smelting same will be greater than the values recovered.

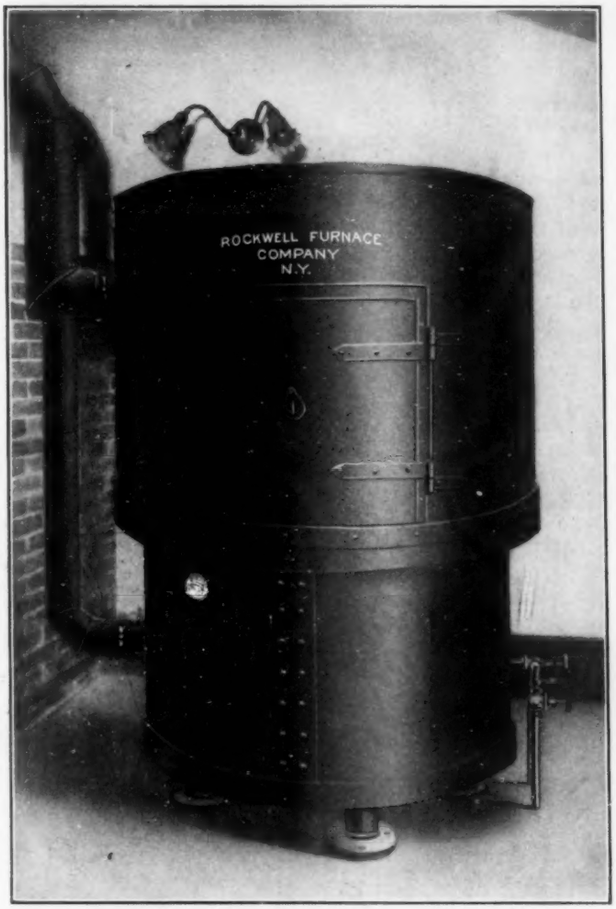
RECOVERY FROM FLOORS, WALLS, CLOTHING AND CARPETS.

In tearing out wooden floors of rooms in which precious metals are worked the wooden pieces should all be saved, as also all dust made by such reconstruction work. In some old establishments the writer has seen melting-room floors that were made of wood and which had been badly burned and also had many cracks in same. From general appearance these floors appear to be clean and not full of metal particles, but in all cases they do carry metal and all wood work used in such places should be burned by slow methods; that is, charred only in order to prevent volatilization of the metals that should be recovered. In case the floor of the melting room is in the basement and a wooden or composite floor is removed, it is advisable to remove the upper two feet of loam or material that is under such a floor and run this material

*Consulting Mechanical, Electrical, and Chemical Engineer.

through a wet process mill or amalgamating system. Cases have been known where several thousand dollars were recovered from the dirt thus taken from beneath a wooden floor; this dirt having no evidence to the eye that it was so rich in value.

The brick grille work that is installed inside the horizontal stacks in the rear of furnaces should be removed at least twice a year, thoroughly scraped and chipped, or broken and thrown entire into the wet mill for crushing and treating. The interior of all brick or iron pipe stacks should be scraped by means of a bag filled with material that will cause the sides of the bag to rub against the interior of the stack and scrape off all sooty particles. All settling chambers into which stacks deliver should be thoroughly cleaned at least once a month and the dust treated by wet system. In the rooms where metals are worked, all rags that are used to wipe oil or metal particles from the machines, should be stored in metal cans and burned or reduced to a charred substance in a furnace of the type shown in cut.



SPECIAL FORM OF REDUCING FURNACE.

Some factories throw their wood and rag waste into furnaces that allow of quick burning, or a flame reduction, and do not appear to realize that by this method a certain portion of their values are going up the stack. All residue or waste that is supposed to carry values, the same being burnable, should be placed in a furnace that has a heavy iron pan in which this material can be charred slowly. The general practice of heating the pan is by an oil or gas flame under the pan. The top of the furnace should be made removable in order to replace the iron pan when same is burnt through. The action of the heat on the material in the pan will char same and the values will be recovered in buttons or thin slabs in the base of the pan after furnace has cooled off.

It has been found advisable to furnish the operators on precious metals with sleeve protectors, aprons, mitts and sometimes footwear and clothes for use in these rooms, the articles thus furnished to be returned to the manufacturer after such apparel is ready for discarding and to be burned for the value therein. The waste water from all dipping tanks, sinks, basins and shower baths should be piped to settling tanks in the basement, in order to save values washed from manufactured articles or from the bodies of the operators. It is best to provide two settling wells and allow the first well to discharge into the second well, then to have the second well fitted with a box overflow, from which the waste water and slime must pass through a series of screens or blankets before passing to the sewer. If one believes that the waste water is carrying metals in solution an automatic "doping" pot should be installed to discharge into the settling well and throw down the metals in solution. It is sometimes advisable and also made necessary by the city regulations to install a pot that will inject an alkaline solution into acid waste water before discharging same into the city sewers. In case old piping, that has carried waste water, that carry values, is removed, the old pipe work should be thoroughly hammered and cleaned inside of all deposits, as the writer has seen an old iron pipe that was nearly half filled with silver residues, while the officials of the plant stated that the pipe was not worth removing. The values recovered from this old pipe paid for several times the amount required for the purchase of new pipe work, and at the same time caused the owners of this plant to more fully protect their wastes in several departments.

In rooms where filing, engraving or like work is carried on, it is advisable to cover the floor with a cheap ingrain carpet or with any material that will allow filings or small particles of metal to work through same and deposit on the floor proper; but this covering must be burnable. Where a vacuum cleaning system is used the particles resulting from each day's work, that have not worked through the floor covering, can be removed by the cleaning nozzle, but a large amount of the waste metal will have worked into the meshes of the carpet and will remain therein. The carpet will clean the soles of the shoes of the operators, thus removing the valuable dust that would probably be tracked into the hallway or onto the stairs and be lost, and then can be burned every six months and the values recovered from the meshes of the carpet. Many times the cost of the carpet can be recovered by burning it, and such a procedure generally is a good investment.

(NOTE.—This article will be followed shortly by a description of the recovery of platinum from waste material.—Ed.)

AMERICAN TARIFF UPON CHEAP JEWELRY.

American-made jewelry of cheap and popular types has displaced vast quantities of ornaments and novelties that have been imported from France, Austria and Germany. New York manufacturers say so and add that this will be the principal effect of the new tariff, as far as jewelry is concerned, since no change is made in the 60 per cent. rate of duties imposed on articles made of solid gold and real precious stones. The effect of the tariff law is seen now in the wholesale houses and factories. The factories making this grade of jewelry are busier than they have been in years, and, in many instances, are operated night and day in order to meet the demand. The rate on cheap jewelry ranges from 75 to 85 per cent., against 60 per cent. under the old law.

THE DEVELOPMENT OF MELTING FURNACES.

A Description of the Earliest and Latest Types.

By L. J. Krom.

(Concluded from December.)

THE ROCKWELL CRUCIBLE LIFT OUT FURNACE.

This furnace, manufactured by the Rockwell Furnace Company, 26 Cortlandt street, New York, while simple in construction embodies all the latest improvements, the advisability of which have been taught by actual practice. The crucible rests on a pier tile above the line of the burner opening, the burner, which is operated with a fan blast of 12 ounces, making but little noise, being placed so that the flame strikes on a tangent and swirls around the pot. The tile-lined metal cover lifts and swings, so that the radiated heat does not interfere with the furnace man. When the furnace is in operation this cover is clamped to the top plate and is provided with a large opening for charging scrap (see Fig. 34). A small vent

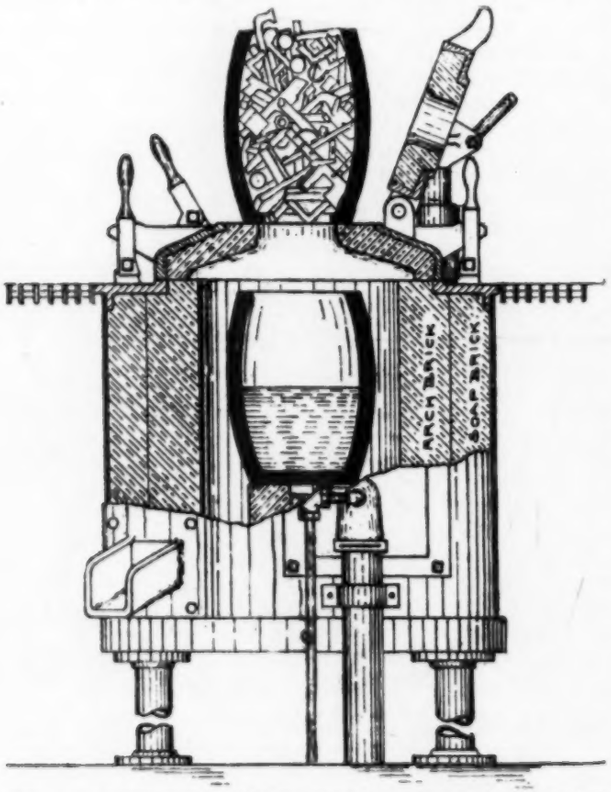


FIG. 34—ROCKWELL FURNACE COMPANY CRUCIBLE LIFT-OUT FURNACE.

cover is also provided for closing the large opening. The furnace is designed with a flue in the rear with a damper which may be connected to the stack if preferred. This metal-to-metal cover arrangement has proven very satisfactory. The air and fuel control valves are arranged so that the handles are on a level with the grating. The top plate is made with an expansion joint to prevent warping and cracking. The slag spout is arranged at the bottom of the furnace, so as to catch the metal either in ingots or an old crucible should the pot break while melting. The furnace is lined with plain shapes, using ordinary soap and arch brick.

Another furnace of the tilting crucible type is the Piat, a furnace of French origin, the American patents of which were bought by the Ajax Metal Company of Philadelphia, Pa., some years ago. This company has since adapted the furnace to its own use for the production of bearing metals and has withdrawn it from the general market. A description of the furnace was published in The Metal Industry, February, 1904.

MELTING FURNACES WITHOUT CRUCIBLES

The furnaces in use at the present time that do not use a crucible container for the melted metal are operated with gas or oil, and therefore one of the objections to the use of this class of fuel, viz., action on the crucible, is removed, while a far more serious one of oxidizing action remains. While it is entirely possible to obtain and maintain a reducing flame in an oil or gas fired furnace, it is equally true that it is most difficult to produce this result uniformly under all conditions.

The pressure of oil, gas, air and steam is bound to vary, and after the proper flame has been produced a variation will occur which upsets the conditions and undue loss results. With these points in view it is advisable to make use of a pit or tilting crucible furnace for all forms of easily oxidizable metals and mixtures, unless some specially designed form of pressure regulator is used. For the higher melting point mixtures and not easily oxidized metals, these "no crucible" furnaces are admirably adapted, and can be and are used to great advantage in many foundries. There is not as high a metal loss as in a pit furnace; there are no ashes to clean, and no crucible expense. There are a number of this class of furnace on the market today and they are being used in all parts of the world with good success.

One of these non-crucible furnaces is the

ROCKWELL DOUBLE CHAMBER MELTING FURNACE,

which has been described in The Metal Industry several times.

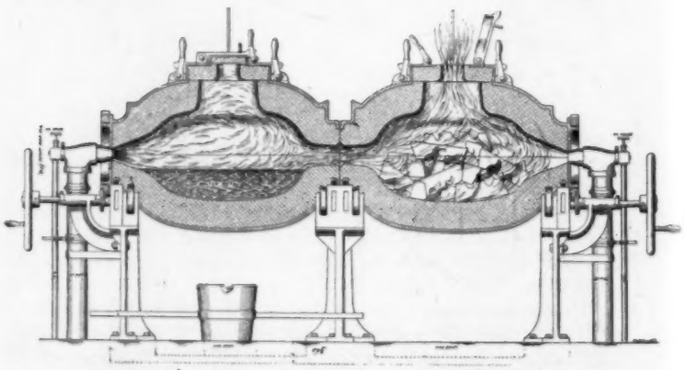


FIG. 35—ROCKWELL FURNACE COMPANY DOUBLE CHAMBER FURNACE.

The Double Chamber Furnace, as shown in Fig. 35, is constructed with two connecting chambers, so arranged that they are used alternately. The exhaust heat from the active or primary chamber flows into the other cham-

ber, thereby simultaneously melting in one chamber and heating the metal in the other chamber to very nearly the melting point with one burner, at no additional cost. This method makes melting practically continuous, permitting various mixtures of metal to follow one another in rapid succession. The furnace shells are cast steel, lined with a special mixture of gannister or carborundum, this mixture being rammed in around an iron core provided with the furnace.

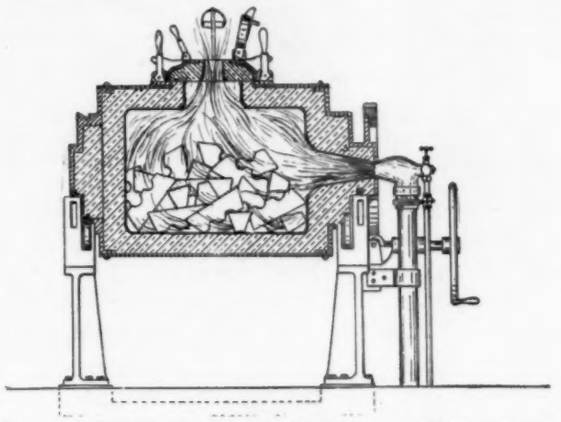


FIG. 36. ROCKWELL FURNACE COMPANY SIMPLEX FURNACE.

This furnace is manufactured by the Rockwell Furnace Company, 26 Cortlandt street, New York City, who claim that the loss from oxidation is very low for the reason that the exhaust heat gradually brings the metal to a melting point before the direct heat is put on.

Another furnace built by the same company is the

SIMPLEX MELTING FURNACE.

A simple, effective and durable furnace for use without crucibles is shown in section in Fig. 36. This furnace was brought out with the idea of low first cost for customers, who did not wish to pay the difference between that and the Double Chamber Furnace, having all the advantages of the Double Chamber Furnace, with the exception of the utilization of the waste heat.

The Simplex furnace is built singly, as shown in Fig. 36, or with two chambers mounted on a common bed plate, thereby economizing floor space and allowing heats of various mixtures to be melted in rapid succession and permitting heats equal to the combined capacity of both chambers being melted and poured at the same time.

CONSTRUCTION.

The construction of both furnaces is exactly the same and consists of the following: The furnace chamber is made of steel with cast iron heads and a cast steel collar around the pouring opening (which may be easily replaced), fitted with a durable door and covered vent, to protect the metal and lining, which is opened when in operation and closed when not in operation. The chamber rests on undercut cast iron stands, is easily revolved on roller bearings by means of a worm and gear, operated with a hand wheel and is mounted on a cast iron bed plate.

ADVANTAGES.

Some of the advantages claimed by the manufacturers for "The Simplex" include the following: Low first cost. No crucibles. No ashes. Convenient and easy to reline with carborundum, gannister or cheap special tile. Cool —very little radiated heat—metal always ready at any desired temperature. Quick heats. Requires little floor space. All above the floor. Operated with low pressure fan blast. Output regular and reliable regardless of draft or weather conditions.

THE SCHWARZ METAL MELTING AND REFINING FURNACE,

shown in cut (Fig. 37) and manufactured by the Hawley Down Draft Furnace Company, Chicago, Ill.

This furnace is built in seven sizes, with capacities per heat of from 100 to 20,000 pounds. The fuel used is crude, fuel oil, or gas. The furnace is lined with high-

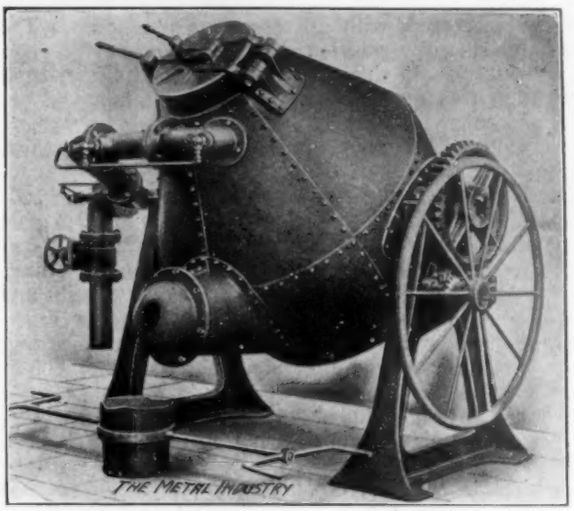


FIG. 37. SCHWARZ METAL MELTING AND REFINING FURNACE.

grade fire-brick tile for brass and bronze melting and special brick for iron and steel. The makers claim for this furnace that the cost of labor and the melting of metal is reduced to less than one-half of the old crucible practice; under ordinary conditions any foundry can save the entire cost of the installation of this furnace in less than one year.

CONCLUSION.

There are several other furnaces of this type that may be mentioned. Among them are included the Charlier, with its accompanying improvements and modifications. The Lunkenheimer, which latter furnace is used exclusively by the Lunkenheimer Company, manufacturers of steam, air and water valves, etc., Cincinnati, Ohio. This furnace has been withdrawn from the market. The Porteous, a portable tilting furnace which was mounted on wheels or a truck, to be moved to the molds. The Orbison, a Pacific Coast production, and the Paxson-Brown, the latter of which is also not now manufactured. All of these furnaces have been described in THE METAL INDUSTRY from time to time and therefore require no repetition.

MANUFACTURE OF WROUGHT BRASS.

A descriptive article on the manufacture of wrought brass was begun in the January issue of THE METAL INDUSTRY. The article opened with a summary of the various mixtures used for making brass, together with purposes for which they are adapted. A continuation of the article will be published in March to continue for several issues. The production of wrought brass will be described, beginning at the casting shop and proceeding through the various processes of manufacture from raw stock to finished product.

MODERN BRONZES*

THEIR CONSTITUTION, PROPERTIES AND USES.
BY A. H. HIORNS.†

(Continued from January.)

COMPOSITION AND COLOR OF BRONZES.

Shepherd and Upton found the tenacity of cast plates to vary from 10 tons with pure copper up to a maximum of 24 tons for the alloy with 81 per cent. copper, and by increasing the tin the tenacity fell off considerably. By heating to low redness and quenching in water the tenacity increased, with 28 tons as a maximum. The maximum ductility was found by annealing at 450 degs. C. for a week. In this way a maximum of 47 per cent. elongation was reached for the alloy containing 42 per cent .of copper.

The color of bronzes varies from red to white, according to the composition.

From 95 to 100 per cent. of copper the alloys are red: from 90 to 95 a golden yellow; from 85 to 90 a pale gold, and below this the yellow color gradually disappears, and at 50 per cent. the alloy is white. Alloys with 1 to 2 per cent. of tin are malleable, ductile and tough, nevertheless a too vigorous hammering or drawing will cause cracks to appear on the surface. Forging has a great hardening effect on a bronze with consequent brittleness.

I have already alluded to the effect of quenching, which considerably modifies the properties of a bronze. Dussanoy found that one of the best alloys to undergo quenching is that corresponding to copper—88.9 and tin 11.1 per cent. Rich found that alloys with 18 per cent. tin have increased density after quenching. Krupp states that the most susceptible alloy to quenching is one containing 84 per cent. of copper. Even if the piece is thick it preserves throughout its thickness a certain malleability, which is preserved after forging. If it is desired to restore a cast piece, which has been quenched, to its primitive hardness it is only necessary to make it red hot and allow it to cool slowly when it becomes hard. Thus we see that quick cooling strengthens and softens, while a slow cooling weakens and hardens certain bronzes. Moreover, bronze articles after quick cooling have a deeper tone, which is valuable in the case of bells.

BRONZES FOR MECHANICAL CONSTRUCTION.

These may be divided into two classes: 1. Serving for antifriction as in bearings. 2. Bronzes for work other than antifriction, such as gearing.

Bearing bronzes generally contain 81-87 parts copper and 19-13 parts tin, according to the work it has to support and the conditions of friction. Thus bronze for working on high carbon hardened steel would not be suitable for medium carbon steel. A bronze, while being chiefly submitted to friction stresses, may also be subjected to shock, such as the crank heads of petrol motors.

	Cu.	Sn.	Zn.	
Ordinary bearings.....	81	17	2	parts per 100.
" "	82	17	1	" " "
" "	82	18	..	" " "
Continuous friction.....	82	16	2	" " "
Alternating friction.....	84	14	2	" " "

STRUCTURAL BRONZES.

	Cu.	Sn.	Zn.	Pb.	
Cocks	88	10	2	..	Parts per 100
"	88	8	4	..	" " "
Stuffing boxes.....	86	11	3	..	parts per 100
" "	81	3	13	3	" " "
Wagon wheel boxes..	88	10	2	..	" " "
Steam whistles.....	81	17	2	..	" " "
Piston segments.....	88	3	9		(Sometimes lead).

BRONZE FOR STATUES.

These bronzes while consisting chiefly of copper and tin also contain zinc and often lead. The addition of zinc gives greater fluidity, files and works better and gives a good patina on exposure to the air. Brass alone is not sufficiently hard for carving. The following compositions are used:

Copper = 90-78. Tin = 2-4. Zinc = 10-18.

The variation in color is obtained by varying the composition but excess of tin makes the metal brittle.

Color.	Cu.	Sn.	Zn.	Pb.
Yellowish-red	87	7	3	3
" "	85	4	11	..
Orange-red	83	5	12	..
Orange-yellow	75-81	3-4	20-25	..
Yellow	65-70	3	32-27	..

BRONZE FOR MEDALS AND COINS.

Tin hardens copper and the bronze wears better, but it must be malleable in order to be stamped. The following is the composition:

	Cu.	Sn.	Zn.
Medals with high relief.....	97	2	1
Fine medals	92	8	..
Coinage	95	4	1

For those containing more than 8 per cent. of tin they must be quenched at a red heat.

SUMMARY.

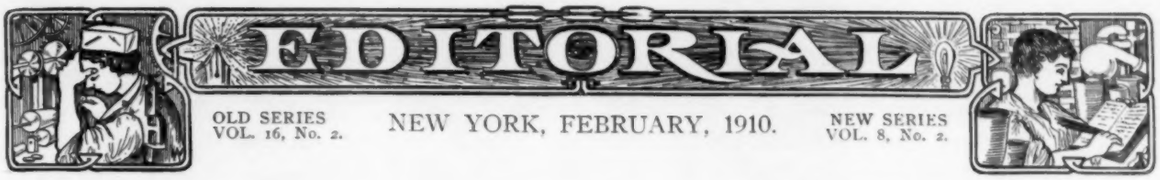
Structural bronzes containing 81-87 per cent. copper are used for work subjected to friction. They are formed after slow cooling of alpha and delta (CuSn). The more the tin the greater the amount of delta and the greater the hardness and brittleness. Those with 88-91 per cent. copper are used for bodies subjected to shock, such as gearing. They contain very little delta after slow cooling, and much of the alpha, which is malleable and ductile and moderately soft. With these bronzes quenching should be done between 550 and 750 degs. If this is done the beta body is formed, which permits of the alloy being forged.

(To be continued.)

*Paper read before the Birmingham Metallurgical Society.
†Professor of Metallurgy.

CONTROL OF PLATINUM IN RUSSIA.

The proposition is renewed that the Imperial Bank should receive the platinum and lend practically its whole value to the depositor, and, if necessary, undertake the sale of the pure metal. To this policy, it is held, there is no obstacle in the economic arrangements of the country, which already runs its own railways, conducts the retail liquor traffic, and is even taking measures, it is said, to open retail tobacco shops. The agitation is obviously being engineered in anticipation of the opening of the new session of the Duma, when it is known the platinum question will be submitted for consideration.



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THE ALUMINUM WORLD
THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS' REVIEW
COPPER AND BRASS

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REMOVAL NOTICE

With the publication of this issue THE METAL INDUSTRY moves its office to 99 John Street, New York City

THE PREVENTION OF INDUSTRIAL ACCIDENTS.

The subject of industrial accidents is an extremely broad one and one that is vitally important in all classes of commercial enterprises. The question of the prevention of accidents in industrial establishments is daily receiving more attention, not only from the manufacturers but also from the insurance companies and finally from the work people themselves.

It is only a short time ago, when an accident in a factory, resulting either in the death or maiming of an operative, was considered an "accident" and nothing more. No particular attention was paid to the conditions incidental to the accident and no particular provision made for the prevention of a repetition. We know of a case about four years ago in a brass rolling mill, where a man was set to attend to the coiler, a machine by which the sheet or strip of brass coming from the rolls was wound on a spindle in a tight coil for convenience in handling. There was a lever at the bottom of the machine, the pressing of which by the foot caused the spindle to revolve in the opposite direction, thus releasing the coil of brass. The position of the operator at this machine was logically with his body parallel to the spindle, then after pressing the lever, to step around so that the coil was in front of him, with the spindle in line with his body. He thus was enabled to grasp the coil in both hands and draw it off the spindle.

After the man had run the machine for some little time, he became careless and instead of pressing the lever from the side, he would reach in under from in front. The result was that one day his clothing was caught at the middle of his body and he was whirled around like a pin wheel, his heavy boots striking the floor at every revolution with a report like a small cannon. Strange to say he suffered no injury other than a bad shaking up and the loss of every stitch of clothing. When all of his apparel was ripped off, he dropped to the floor. This accident did not impress the company very much and no effort was made to change the conditions.

Shortly after this experience another man was put to work on a coiler of the same kind on a different set of rolls, which were revolving at a faster rate of speed.

He was told (verbally) not to press the lever from the front, but in time he did so, and his hand was caught in the folds of the coil of brass and twisted off at

the wrist as clean as though cut by an axe. This did not cause any perceptible anxiety on the part of the officials other than the offer to set the victim up in a cigar stand with a few hundred dollars! He, though a poor man, refused the offer and was given employment as a gate tender, but as he could not write, his right hand being gone, he could not keep records. He was then shifted from one department to another, each foreman being given instructions to "let him go" if not serviceable! But he never went, no man being willing to take the onus of discharging a one-armed man. As far as we know he is still playing the part of a human shuttle-cock.

Both of these accidents and a number of others of a similar nature could have been prevented by the placing of one or two rods or a low screen of metal on the floor just under the spindle at the end, which would have prevented the operator from working the lever except from the right place. This has changed now and earnest efforts are being made all over the country to protect the operator from him or herself, not alone from a desire to be free from damage suits but also from a humanitarian point of view.

At the present time this apathy and seeming indifference to the loss of life and limb on the part of factory officials is becoming less and less. New and novel devices are being devised every day for the prevention of just such accidents as those mentioned above. A museum of safety and sanitation has been established in New York City where models of safety and sanitary devices are on exhibition and methods for the prevention of accidents are discussed at meetings held for the purpose.

Perhaps one of the best aids to the furthering of such a work, and also for the enlightenment of the public in general, is the General Pamphlet No. 1, issued September, 1909, by the Fidelity and Casualty Company of New York. This book is entitled "The Prevention of Industrial Accidents" and was prepared by Frank E. Law and Wm. Newell, mechanical engineers attached to the staff of the company. We quote from the introduction of the book:

> The desirability of preventing accidents no one will question. Putting aside the humanitarian aspect of the matter, which must appeal to every lover of his kind, the financial loss alone due to accidents is so great as to warrant the most complete precautions for their prevention. In the year 1908 the large sum of $22,392,072 was paid in premiums to insurance companies for liability insurance. The prevention of accidents absolutely is of course impossible. But much more can be done to prevent accidents than at first sight appears.
>
> Statistics regarding the causes of indutrial accidents in the United States have not been collected except in fragmentary form. It is but lately in fact that much interest has been taken in the matter. This is perhaps not surprising, as it is not long since the responsibility of the employer for the safety of his employees was brought home to him. Employers' Liability insurance to meet this increased responsibility is comparatively new in this country, having been first transacted in 1886, and only within the last few years having reached its present high development.
>
> It is to Germany that we must turn for exact information regarding the causes of accidents. From statistics collected there in connection with Workmen's Compensation insurance, it appears that the greater number of accidents, 57.95 per cent., are due to the negligence of employers or employees, and the smaller number, 42.05 per cent., to the inevitable risks of employment. The causes of accidents are stated as follows:

Inevitable risk	42.05	per cent.
Want of skill and carelessness	20.25	" "
Want of guards	7.82	" "
Deficient factory arrangements	7.15	" "
Acting against rules	5.44	" "
Fault of other (third) persons	5.28	" "
Fault of employers and workmen	4.66	" "
Not using guards	1.92	" "
Insufficient instruction	1.84	" "
Superior force, casualty, etc	1.31	" "
Carelessness	1.19	" "
Unfit clothes	0.49	" "

> In considering these percentages, it should be borne in mind that the precautions for preventing industrial accidents are far and away more complete in Germany than in the United States. Under the administration of the Workmen's Compensation laws, the invention and use of safety devices are encouraged and the use of safety devices has consequently become very general. The United States not having progressed so far, it is probable that more than 57.95 per cent. of the accidents that occur are preventable.
>
> From the foregoing it is clear that a wide field exists for the prevention of industrial accidents. All accidents due to negligence are evidently preventable. The means of prevention lie in the direction, first, of proper design and construction of the plant and appliances; second, of care on the part of employers and employees; and third, of the use of safety devices.

The book itself contains a great amount of very valuable information and should be in the hands of every manufacturer and employer of labor. After giving some statistics regarding accidents in general and some commen-sense rules and regulations, the book proceeds to describe safety devices. These are grouped under the following heads: Steam Boilers, Engines, Electrical Apparatus, Elevators, The Factory and Wood Working Machinery. Each class of machinery is thoroughly treated and clear and interesting descriptions are given of the various safety devices together with the advantages of their use. The book will be followed by other pamphlets in serial form devoted severally to specific industries. The book together with the subsidiary pamphlets may be obtained upon application to the Fidelity and Casualty Company, New York.

THE COPPER MERGER.

The month of February is well on its way into history, and the reported consolidation of copper interests does not seem to be any nearer of completion than several months ago. The rumors and counter-rumors have been kept alive, however, and doubtless have formed the basis for many successful stock transactions in Wall Street. Should the merger be finally formed with its publicly announced purpose of restricting production and raising the price of copper, the Government would undoubtedly take action.

The determined attitude of the Government towards "combinations in restraint of trade" is evidently one of the prime reasons for the delay in the plans of the promotors of the gigantic trust. Another and equally important reason seems to be based on the report that it is a question as to which of the combining companies should get the largest share of the proceeds. That the

amount of capital involved (on paper at least) would be enormous is evidenced by the report that Lawyer Untermyer's fee in the merger of the Utah Copper Company and the Boston Consolidated Mining Company was $775,000. This lately consummated consolidation is a very small affair compared with the proposed large combination.

What would seem to be one of the first steps towards the big merger, is the announcement that the Anaconda Copper Mining Company intends to increase its capital from $30,000,000 to $150,000,000, for the purpose of consolidating all of the Amalgamated subsidiaries and the Cole-Ryan properties on Butte Hill, Montana. One of the principal reasons for this combination, as given out, is that, owing to the peculiarities of Montana mining law, the amalgamation of contiguous properties is the only reasonable way to avoid litigation over ownership of ore bodies. Economy of operation gained by physical coalescence of properties already owned by allied interests, is also claimed.

If, by this combination, increased efficiency is effected, and there is no good reason in sight that it will not be, then the merger is a good thing for consumer and producer alike. The passing of Amalgamated should not be greatly deplored, as, according to The Engineering and Mining Journal, "it never made a decent report to its stockholders" and appeared to favor operations of a stock jobbing character.

Whether a further combination of interests can be effected, to draw in properties not allied and in States where the "apex law" does not apply, remains to be seen. Of the utility of such a merger we are not so sure, except in some such way as we outlined in a recent opinion.* We are certain, however, that all is not roses as yet in the path of the proposed consolidation. Fear of governmental restriction and inter-interest strife may be, however, finally overcome and proceedings continue until a gigantic trust, larger and more powerful than any in the world, emerges from the clouds of rumor.

But all this suspense and speculation does not help the consumer. With prices unsettled and markets in a chaotic state, the best he can do is to buy copper for immediate needs only and conduct his business on as broad and yet conservative lines as possible. All he has in front of him is the hope that soon something may be done to improve present conditions.

It might be possible that the investigation regarding trusts by the Government, now in progress, will result in time to come in establishing a "Trust Commission" to be continued indefinitely as a part of the Cabinet, this "Commission" to have power to regulate capitalization within certain limits in proportion to visible assets, to set a standard of profits, or, in other words, to regulate selling prices, based on actual cost of all products and commodities necessary for the maintenance of life and for the successful operation of commercial enterprises. Such a commission could effectively restrain over-capitalization and stock jobbing operations and foster healthy competition, which, after all, is the "life of trade."

*The Metal Industry, December, 1909.

CRITICISM AND COMMENT
WE CORDIALLY INVITE READERS' OPINIONS AND CRITICISMS OF ARTICLES PUBLISHED IN THE METAL INDUSTRY. SUGGESTIONS WELCOME.

NEW BOOKS

THE ELEMENTS OF METALLOGRAPHY. By Dr. Rudolph Ruer, Privatdozent at the University of Goettingen. Authorized Translation by C. H. Mathewson, Ph.D., Instructor in Chemistry and Metallurgy at The Sheffield Scientific School of Yale University, New Haven, Conn. Size, 6¼ x 9 inches; 342 pages; 119 Illustrations. Price, $3. John Wiley & Sons, New York.

The subject of metallography is being given very close attention at the present time and great progress has been made in the study of the molecular constitution of metallic alloys. This book by Professor Ruer makes a very valuable addition to the existing literature on the subject. It will enable the student or practical worker, who it presupposes has sufficient chemical and metallurgical knowledge to understand the text, to follow up his investigations intelligently in the alloy field.

In the book there are two parts. Part one consists of four chapters which treat of the theory and are as follows: Chapter I, on One Component System. Chapter II, Heterogeneous Equilibria. Chapter III, Two Component Systems. Chapter IV, Three Component Systems. Part two is devoted to practice and contains two chapters. Chapter I treats on Thermal Investigation and Chapter II is devoted to Investigation of Structure. In this chapter are given instructions for preparation of sections, development of structure by etching, microscopical investigation and photography.

For sale by The Metal Industry.

MORE COMMENTS ON RUST-PROOF NICKELING.

To The Editor of The Metal Industry:

I note in the January number of The Metal Industry an article on page 35 by W. L. Churchill, who states that more detailed information would be desirable regarding rust-proof nickel plating. I prefer not to write any lengthy articles for publication at the present time until we have had more comments from others. I have recently written a booklet for the American Electro-Chemical Company, of Chicago, on this subject, which they distribute free for the asking. I would suggest that those who desire further information send for same.

Regarding blistering and imperfect protection, such might have been caused by using chemicals containing chlorine; for instance, sal ammoniac, salt or muriatic acid, in either the zinc or nickel solution. The writer was under the impression that this was no longer used, as the harmfulness of it was long ago demonstrated, but recently several instances have come to the his notice where inferior work has been caused by using same. Evidently some platers are not aware of the harm caused by chlorides in plating solutions, and are misled by the apparent benefits in faster depositing, etc. John Nelson.

Chicago, Ill., Jan. 27, 1910.

COMPOSITION OF BRASS FOUNDRY FLUXES.

To The Editor of The Metal Industry:

We read your account of the results accomplished with the brass foundry flux advertised and sold as Homogen, and failing to account for its alleged virtues we have analyzed a sample of apparently the same material sold under a different name, with the following result:

Manganese dioxide	38/05%
" oxide	3.17%
Ferric and aluminum oxides	2.10%
Silica	4.30%
Barium and calcium oxides	11%
Carbon	10.94%
Borax	23.67%
Water	17/60%

The ingredients in the bracket are the constituents of ordinary black oxide of manganese costing in casks 4c. a pound. The borax costs 5c. a pound, the carbon, or probably only powdered charcoal is an inexpensive reducing agent. The manganese dioxide is of course powerfully oxidizing. Perhaps, contrary to theory, it serves some useful purpose. The 18 per cent. water which the compound contains can be obtained in Jersey at a very low price. The solid constituents make it cost less than 4c. a pound, and assuming it to possess the virtues claimed, the market price of 15c. plus freight, must yield a very satisfactory profit.

Plainfield, N. J., Jan. 29, 1910. S. W. Rushmore,
President Rushmore Searchlight Company.

APPRECIATION.

To The Editor of The Metal Industry:

I wish to thank you for the benefit I received from the article written by Chas. H. Proctor in the January number of The Metal Industry. Mr. Proctor's recommendation of adding alum to an acid copper solution for overcoming streaking troubles proved to be very valuable to me, and the recipe is worth more to me than the price of the magazine for several years. Arthur Thiemaun.

Oshkosh, Wis., Jan. 31, 1910.

ANALYSIS OF "HOMOGEN."

To the Editor of The Metal Industry:

In reply to your inquiry we beg to say that we do not publish the analysis of Homogen. You ask for comments on why it costs so much per pound. Any article is worth what it will bring, regardless of the cost to produce it, and it is a proven fact that we are not asking too much for Homogen, as our customers are continually growing, and the volume of our business increasing about 25 per cent. per month.

The Allyne Brass Foundry Co.,
C. P. Mebane, Manager Homogen Dept.

Cleveland, O., Feb. 9, 1910.

OPINIONS.

To The Editor of The Metal Industry:

I have examined with a great deal of pleasure and benefit your January issue of The Metal Industry, and so far as I am capable of judging, I should say that you were justly proud of it. You are to be commended for sticking strictly to business and leaving miscellaneous fillers to publications of a general character. O. C. Harn.

Manager Advertising Dept., National Lead Company.

New York, Feb. 1, 1910.

CONGRATULATIONS.

To The Editor of The Metal Industry:

Accept my congratulations for the splendid international anniversary number of The Metal Industry.

The Metal Industry today stands preëminently the foremost trade journal in the United States or Europe.

Charles H. Proctor,
President National Electro-Platers Association of the United States and Canada.

Arlington, N. J., Jan. 20, 1910.

Shop Problems

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE OF THE METAL INDUSTRY. ADDRESS THE METAL INDUSTRY.

CASTING

Q.—How much melted bronze could be poured into a sand basin of one cubic foot capacity?

A.—You do not state the mixture of the bronze you wish to melt. The weight per cubic foot for various mixtures of brass and bronze given by several authorities are as follows: Haswell's Handbook.—Brass, copper, 67, spelter, 33 parts, 519.36 pounds; Gun Bronze, copper 88, tin 10, and spelter 2 parts 546.22 pounds, Bronze, copper 84, tin 16 parts, 551.34 pounds. R. H. Thurston "Materials of Engineering, Alloys, Brasses and Bronzes."—Brass, copper 60, spelter 40 parts, 524.68 pounds, Bronze, copper 90, tin 10 parts, 541 pounds, and Ansonia Copper Company, Tobin Bronze, copper 62, spelter 36½ and tin 1½ parts, 523 pounds.—K.

CLEANING

Q.—How can we avoid removing the oxidized finish on goods, when using the electric cleaning process?

A.—In the composition of electrical cleaning baths, cyanide is added to prevent oxidation and as such are recommended, if you oxidize your work previous to cleansing and wish to preserve this, omit half of the caustic soda mentioned and make the balance carbonate of soda. You will then avoid the removal of the oxide.—C. H. P.

Q.—Will you kindly tell us the best method for cleaning the emery off of a leather covered wooden polishing wheel. Do you think that it would be better to wash it off or to wear it down by means of carborundum or some other abrasive material?

A.—The best way to clean a leather covered wooden wheel of emery is by washing. In order to accomplish this properly, particularly where a number of wheels are used per day, is to have a trough made of either galvanized iron or wood of suitable size to take care of the particular number of wheels that are in use. Where 25 to 30 polishers are employed the tank should be about 3 or 4 feet in length, 8 or 10 inches deep and 20 inches wide. There should be two wooden rollers about 6 inches in diameter placed lengthwise of the trough and parallel with each other. These rollers have pulleys to which is attached a belt running from the main shaft. The rollers are put in the trough, which is filled with water, so that they are submerged about 2 inches; the speed of the roll should be slow, say anywhere from 15 to 20 revolutions per minute. Place the wheel on the rollers and let it revolve until clean. If the water is warm it will wash rapidly.

A leather covered wooden wheel or a compressed leather wheel should never be cleaned in any other way, unless there are only one or two used a day and then in this case a very good method is to set a bucket of water as warm as the hand will stand, on the polishing stand. While the wheel is revolving, apply the water to its surface with a piece of waste and hold a brick under it, using as much water as is possible. The brick should be held against the wheel continuously while applying the water until the wheel is cleaned. Carborundum brick, emery stone or buff sticks should never be used to clean the emery off of these wheels as they create a heat and thus blister or loosen the leather and is dangerous and very injurious to the wheel.—T. C. E.

COLORING

Q.—You will oblige me by telling how to get a dark green gold on sash pins with a dark background.

A.—Dissolve arsenic in caustic soda by the aid of boiling water. One ounce of caustic soda will dissolve 2 ozs. of white arsenic, then add very carefully a little of the sodium arsenate to your green gold, which should be run cold. This produces a black smut, which can be easily removed with bicarbonate of soda, as is customary in relieving rose gold, and the green will then show a very dark olive green background with light green high lights.—C. H. P.

DIPPING

Q.—Am dipping high brass washers for a firm, and sometimes have a lot of trouble because the washers stick together in the dip, and so do not come out bright. The washers are about as big and thick as a penny. What shall I do?

A.—Use a large earthen ware dip basket, and do not put in too many at a time as they are not so liable to bank up on each other when only a few dozen are dipped at a time.

If you have a tumbling barrel or tumbling machine you might try tumbling them for a few minutes after dipping.—O. A. H.

FINISHING

Q.—We make a large quantity of medium priced roll plate baby pins and brooches, which we satin finish on the brass back, then color them Roman and polish the front. The brass back and pin keep the Roman color all right, but the joint and catch turn black in a couple of months. Will you suggest a remedy?

A.—You evidently use silver solder, and the reason it turns black is that the fine gold coat is not heavy enough to fully protect it from the atmosphere. The proper way to finish the articles is to dip them for an instant in a dip made of equal parts of nitric acid and oil of vitrol, then satin finish them and color for a few seconds in a 14K solution, afterwards finishing in the fine gold solution as usual.—O. A. H.

Q.—Kindly give me a formula for Verde green on brass, also give me an oxidize on copper that I can use cold.

A.—Verde finishes should always be protected with a satin finish lacquer because the green formation is very easily removed. Lacquering protects the finish and when waxed gives the artistic finish so much desired. If you require a light verde upon brass proceed as follows: Dissolve 1 pound of sulphate of copper and 1 pound of sal ammoniac in each gallon of boiling water; cleanse the brass articles with pumice stone and a brass brush or tampico wheel, then wash and immerse or brush the solution on the articles; a dark formation with a green tint will appear when the articles are allowed to dry from the solution without washing; now prepare a solution of carbonate of ammonia, 1 ounce to a pint of water, and brush over the article with a stippling motion and allow to dry for a short time. If the bluish green that appears is not sufficiently dense, then pass the articles through clean cold water for a few seconds. On removing, the articles will be covered with Verde green. The articles should be dried in the air and then lacquered as above.

For oxidizing copper with a cold solution dissolve 1 ounce of sulphuret of potassium and ¼ ounce of sulphate of ammonia in a little hot water, then add the balance of the cold water to make up the proportion needed. Hydrosulphuret of ammonia can also be used; this is in liquid form. 1 ounce, by measure, will also give the same results as noted above.—C. H. P.

OXIDIZING

Q.—Our plater uses liver of sulphur to obtain a black copper finish. The color is just what we want but sometimes comes out of the dip looking sooty, and rubs off in patches. What is the reason?

A.—When copper plated articles assume a sooty appearance in the liver of sulphur dip, it is positive proof that the dip is too strong or too old. 1 oz. of liver of sulphur per gallon of water will make a dip that will oxidize copper rapidly without causing it to peel. If the liver of sulphur is low grade, the addition of about 2 oz. of caustic soda per gallon of dip will prove beneficial. —O. A. H.

PLATING

Q.—Kindly tell me how much sulphate of copper and sulphuric acid should be used in an acid copper solution to keep it in good working condition. Also how much cyanide of potassium and carbonate of copper for a cyanide solution.

A.—A good acid copper solution should consist of the following formula:

Sulphate of copper	1¾ lbs.
Sulphuric acid	2½ ozs.
Alum	1½ "
Water	1 gal.

As acid copper solution becomes too acid after continual use, it is not necessary to add more acid after the first addition. Very beneficial results can be obtained by adding ½ oz. of alum to each gallon of solution occasionally, this will assist in reducing the acid and aid the conduction of the solution. The solution should occasionally be freshened up, when too acid by reducing with water and adding an additional amount of the sulphate of copper to maintain the metallic strength.

A cyanide of copper bath should consist of the following:

Water	1 gal.
Copper carbonate	3 ozs.
Bisulphite of soda	2 ozs.
Cyanide of potassium	6 ozs.

A solution when used only two hours per day should last indefinitely with plenty of anode surface and a little cyanide added about once a week, occasionally add a little bisulphite of soda. Of course water will have to be added to take care of the loss by evaporation of the solution.—C. H. P.

SWEATING

Q.—How can I separate brass from a mixture of brass and babbitt metal chips?

A.—The only practical way of separating a mixture of fine brass and babbitt chips, is to spread the mixture in a thin layer over the bottom of a reverberatory sweating furnace, when the babbitt will melt before the brass and will run to the lowest point in the hearth, from which it can be dropped into an iron kettle and refined. The heat can then be raised and the brass chips melted and run into ingots. The brass obtained will probably only be suitable for making car brasses. If only small amounts of the mixed turnings are to be handled, an unlined can with small holes in the bottom at the low end may be substituted for the sweating furnace. It may be heated with a gas flame or other suitable means.—J. L. J.

TINNING

Q.—I should like to inquire if you have a formula for the electro-depositing of tin on sheet steel?

A.—The following formula for a tin solution should overcome the difficulties you are experiencing with other formulas:

Water	1 gal.
Caustic soda	¾ lb.
Hyposulphite of soda	2 ozs.
Common salt	2 ozs.
Tin crystals	¼ lb.

Use anodes of pure tin. The solution can be used hot or cold, but when heated gives the best results.—C. H. P.

TUMBLING

Q.—Received an order for a quantity of drawer pulls, made of malleable iron wire to be nickel plated. Could they be tumbled with steel balls, or must I have them polished by hand. It must be a nice job.

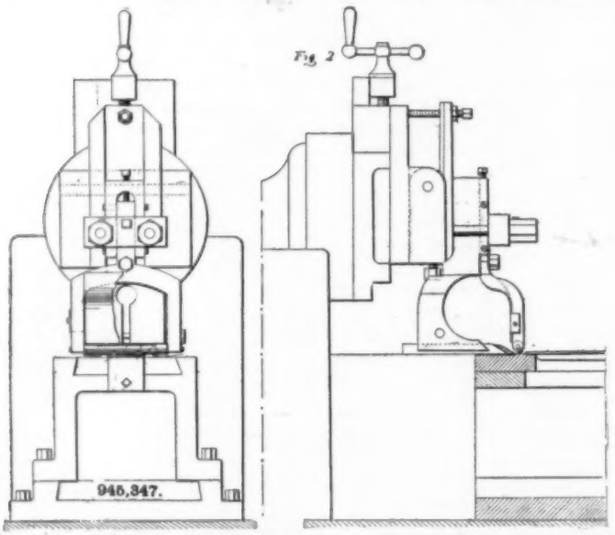
A.—The best way to obtain a high finish on the drawer pulls without hand polishing them, is to use bright drawn wire, copper plated. After the pulls have been bent in the desired shape, they should be tumbled, nickel plated and tumbled again, until perfectly smooth and polished.—O. A. H.

PATENTS

REVIEW OF CURRENT PATENTS OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

945,347. January 4, 1910. Machine for Trimming Blanks for Sheet Metal Sheets. J. H. Shiels, Wallingford, Conn., assignor to International Silver Company, Meriden, Conn.

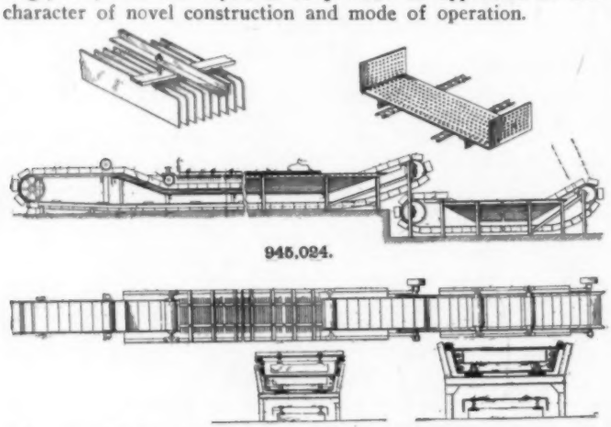
The object of this invention is to provide a machine shown in cut to trim and face blanks, used for sheet metal handles



for knives and other table cutlery, toilet articles, parts for casket hardware and metal mounts of shell-like character for various purposes. The machine so trims and faces the edges of the blanks and shells as to form a perfect joint.

945,024. January 4, 1910. Apparatus for Recovering Material from Scrap Metal. S. W. Egbert, Joliet, Ill.

This invention shown in cut relates to apparatus for recovering material from scrap or waste metals, such as the recovering of tin from scrap tin cans, cuttings, zinc-coated sheets and cuttings, etc., and the object is to provide an apparatus of this character of novel construction and mode of operation.



In general the apparatus consists of an endless conveyor for passing the scrap through a suitable electrolyte in which the material to be recovered is decomposed and collected on a cathode, by an electric current, after which the waste material is in practice discharged on a similar conveyor and carried through a washing or rinsing bath and finally discharged from the apparatus and eventually made into bundles in the usual and well-known way.

In the use of this apparatus the material is recovered and collected in practically pure form and unmixed with dirt or foreign substances and the arrangement is such that the work is continuous and comparatively rapid, so that a large amount of scrap may be quickly and efficiently operated upon by the machine.

945,843. January 11, 1910. Composition for Coating Metals. John B. Higley and Thomas F. Ryan, Eddystone, Penn.

An improved composition for coating metals. This composition is used for preventing electrolysis, alkali deposits, and rust. It may be applied to the metal by means of a brush, sprayed on or by any methods as are in use for applying paints.

The mixture covered by the patent is:

Beeswax	2 lbs.
Rosin	97 "
Banana oil	1 pt.
Linseed oil	2 gals.

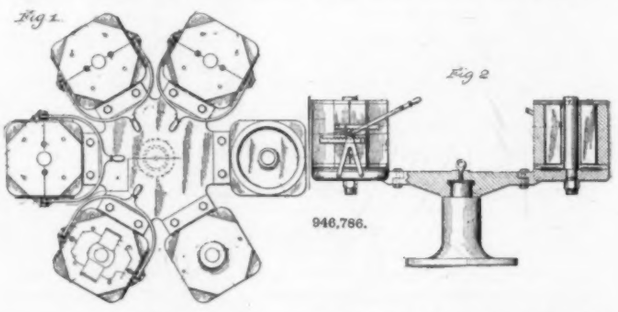
These ingredients are mixed together, and boiled until the desired mixture and consistency are secured.

946,738. January 18, 1910. Method of Manufacturing Brass Dust. Alfred Sang, St. Cloud, France.

A process for the production of brass dust, to be used for coating metals by cementation, the purpose of such process being to obtain a malleable brass covering which will be homogeneous and non-porous and under certain conditions is superior to zinc coating.

The process is conducted as follows: Copper is precipitated as copper dust from copper sulphate solution by addition of zinc dust. The precipitate is filtered and dried, and is then mixed with a certain proportion of zinc dust. The resulting mixture is put into a retort and heated, the retort being agitated in order to insure a thorough mixing of the copper and zinc. Brass dust is thus produced, which is used in the same manner as zinc dust in the sherardizing process.

946,786. January 18, 1910. Molding Machine. Geo. W. Ross, Chicago, Ill., assignor to Railway Foundry Company, Chicago, Ill. The object of this invention is to provide an improved form of mold for facilitating the operation of casting a large number of similar pieces and to provide an improved molding device, adapted for molding railway journal brasses. The means by which these desired ends are accomplished can be better understood by referring to the cut. In the form shown, the machine



comprises a base in the form of a pedestal having an upright spindle at the top, and a table mounted to rotate on the spindle, and provided with a plurality of detachable bed plates, arranged in a circle having its center in the axis of the spindle. Mounted on each of the bed plates is a core which is provided with an integral bottom plate and which is centered on the bed plate by means of a spindle or bolt.

The molds comprise opposite matrices or mold sections, which

fit together at their adjacent edges, and which are shaped at their middle parts to slidably fit guide pieces or walls in the form of feathers mounted on the core. In the form shown, each core has a pair of guide feathers secured thereto at opposite sides and the feathers are of uniform rectangular cross-section and extend vertically throughout the height of the mold cavity. The matrices are so shaped as to form molding cavities. In the form shown, the cavities are shaped for casting railway journal brasses, of the shape shown.

946,903. January 18, 1910. Electrolyte and Method of Electro-Depositing Copper. Edward F. Kern, Knoxville, Tenn., assignor to Percy S. Brown, New York.

This invention is based on the discovery that fluo-silicates in solution will produce a smooth, dense, coherent and adherent deposit of copper. For the bath for coating iron, steel or zinc, the following mixture is used:

Water	100	parts
Copper fluo-silicate	12	"
Ammonium fluo silicate	8	"
" tartrate	6	"
" fluorid	5 or more	"

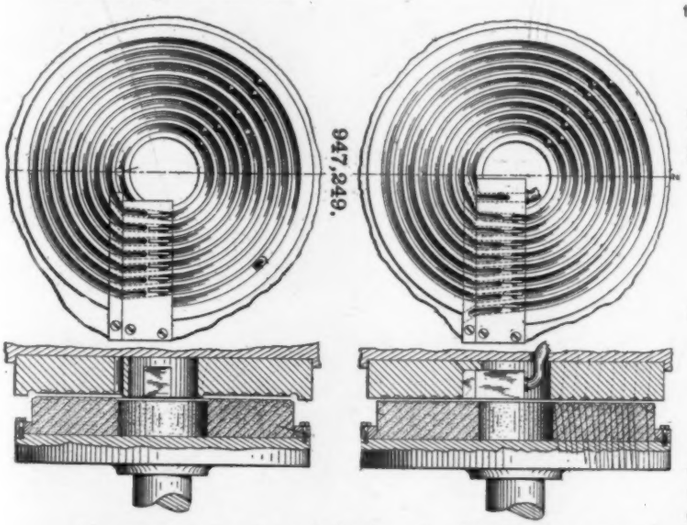
In a bath for coating copper, brass, or certain other metals, the following mixture is found preferable:

Water	100	parts
Copper fluo-silicate	12	"
Ammonium fluo-silicate	8	"
Gelatin or tannin	0.06	"
Ammonium fluorid	5 or more	"

When the copper is to be deposited on iron, steel, or zinc, the bath is used in a neutral or slightly alkaline state, while for depositing on copper, brass, or certain other metals the bath should be neutral or very slightly acid.

947,249. January 25, 1910. Grinding Machine. John F. Lynch, Bristol, Conn., assignor to The New Departure Manufacturing Company, Bristol, Conn.

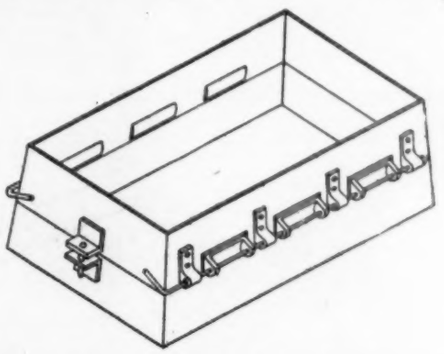
This is a machine, shown in cut, designed to automatically, speedily and accurately grind steel balls, such as are used for ball bearings and the like.



The patent covers the combination of a disk having a grooved raceway for the articles being ground and provided with a recess, of a block in the recess, the block having an entrance groove communicating with the raceway, a transfer groove connecting portions of the raceway, and a delivery groove also communicating with the raceway.

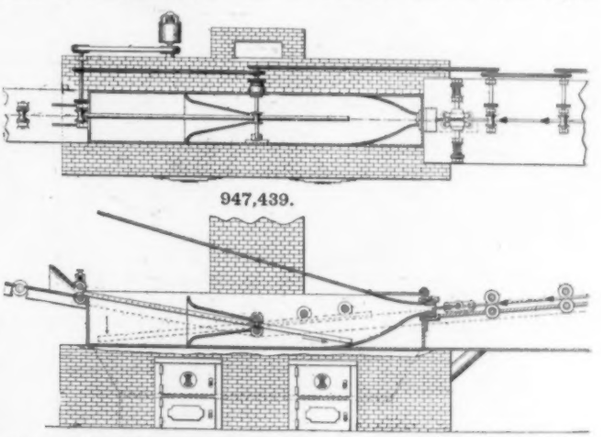
947,261. January 25, 1910. Sand Retaining Device for Foundry Flasks. Arthur Scrivenor, Richmond, Va.

All of the troubles attendant on the use of snap flasks and jackets of the common form can, in both bench and machine molding, be overcome by using tapered flasks and tapered jackets. The tapered flasks shown in cut and covered by this patent are made solid, instead of being made to open. They are removed from the molds by merely lifting them off, the flasks being first slightly rapped, if found necessary, to loosen any sand which might otherwise adhere to the flask. These tapered flasks and jackets may be made of either wood or metal, but metal is probably the most satisfactory material. If the taper of the flask is sufficient to allow it to be easily lifted from the mold, provision is made to retain the sand within the flask during the process of molding; which retaining means is removable before the flask



is lifted from the mold. Where bottom-boards are used the drag will not require any retaining device, as the bottom-board itself will prevent the sand from falling from the drag. But special provision is made to retain the sand in the cope during the process of molding. The drag may also be provided with sand retaining means where bottom-boards are not used. Tapered flasks and jackets may also, within certain limits, be used on floor work.

947,439. January 25, 1910. Art of Treating Metal and Other Tubes and Rods. E. T. Greenfield, Kiamesha, New York. This is a method for treating metal tubes or rods with liquid coatings, such as tinning or galvanizing automatically and with great speed. For this purpose the machine shown in cut is utilized and has been designed to effect a treatment of metal tubes by subjecting the same to a heated bath of some liquid



which will effectually coat the same both exteriorly and interiorly, and with the greatest possible speed, and will subsequently wipe and polish the same; the entire mechanism being preferably automatic in its operation and so arranged that such tubes are first subjected to sufficient heat to sea or set the coating as they are advanced through a treating bath, which bath is in turn subjected to heat from a furnace or the like.

The tubes are then automatically advanced in sequence and successively wiped, both exteriorly and interiorly while still hot, the exterior wiping being effected by means of a stationary wiper of proper softness and flexibility, the interior wiping being subsequently effected through the agency of what is termed a "floating wiper" which is so devised that as the tubes are successively fed forward, the interior is given a polished surface which will be practically as frictionless as that of porcelain lined tubes and rendered free from corrosive action.

INDUSTRIAL

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

WESTMACOTT NEW LINE OF FURNACES.

The accompanying illustrations show the new line of gas blast furnaces which the Westmacott Gas Furnace Company are putting on the market.

No. 1 holds two 2-pound irons and burns 6 feet of gas per hour.
No. 2 " " 4 " " " " 6 " " "
No. 3 " " 2 largest irons " 10 " " "

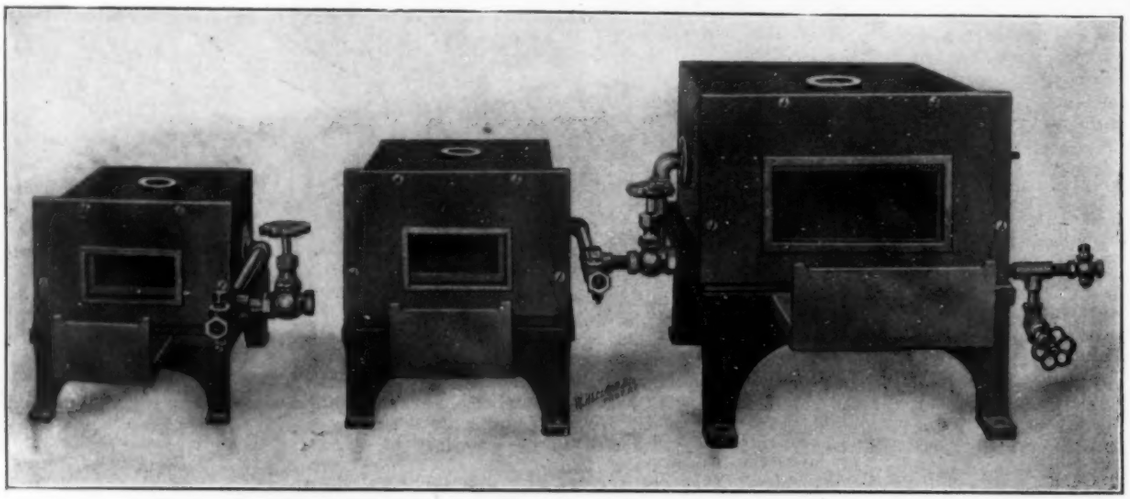


FIG. 1. WESTMACOTT GAS FURNACE COMPANY'S SOLDERING IRON HEATERS.

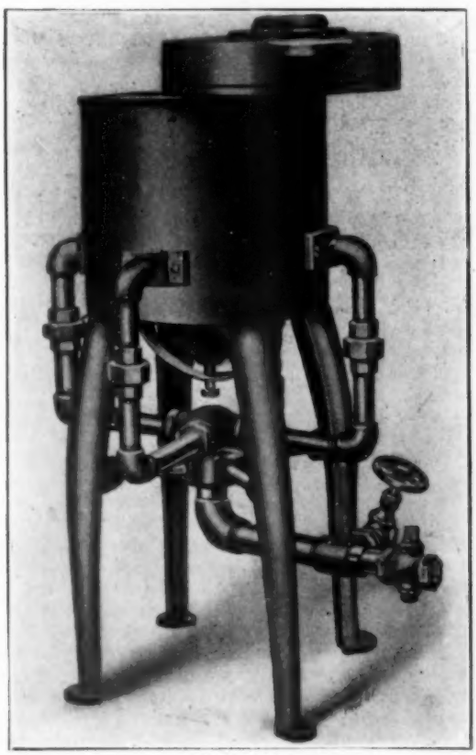


FIG. 2. WESTMACOTT'S GAS FURNACE COMPANY'S MELTING FURNACE.

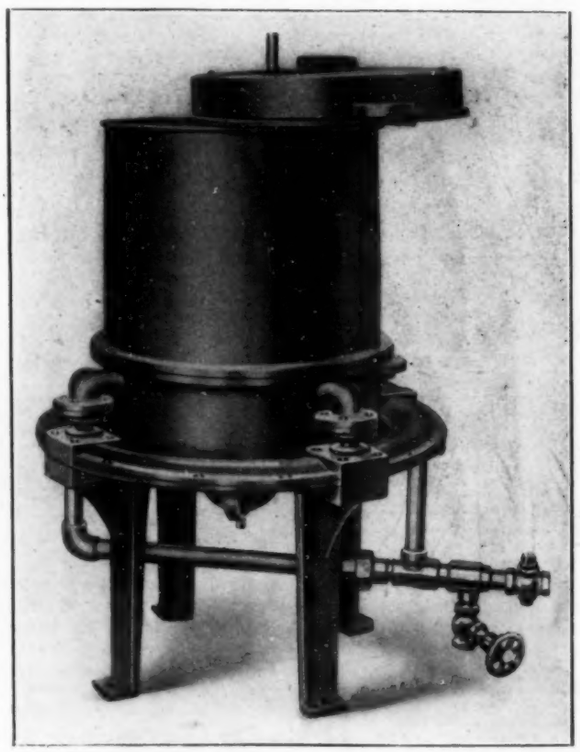


FIG. 3. WESTMACOTT GAS FURNACE COMPANY'S SMELTING FURNACE.

Fig. 1 shows the soldering iron heaters, which are built in three sizes and have the following capacities:

These heaters are believed to be the heaviest in construction now on the market. The weights are: No. 1 weighs 35 pounds;

No. 2, 50 pounds, and No. 3, 107 pounds.

Fig. 2 shows the improved melting furnace, which is also of very heavy construction. It has a cast iron pot, held in place on the bottom with a set of screws as shown in the cut, to drain the furnace in the event of the crucible breaking. The furnace is made in five sizes, of the following specifications:

CAPACITY.

No. 1 holds No. 1 crucible. Consumes 40 cubic feet of gas per hour. Melts 2 pounds copper in 15 minutes.
No. 2 holds No. 2 crucible. Consumes 75 cubic feet of gas per hour. Melts 5 pounds copper in 15 minutes.
No. 3 holds No. 5 crucible. Consumes 110 cubic feet of gas per hour. Melts 10 pounds copper in 15 minutes.
No. 4 holds No. 8 crucible. Consumes 160 cubic feet of gas per hour. Melts 20 pounds copper in 25 minutes.
No. 5 holds No. 14 crucible. Consumes 200 cubic feet of gas per hour. Melts 40 pounds copper in 60 minutes.

These furnaces were made primarily for the melting of gold, silver and other precious metals, but are also used on test melts of iron, steel, copper, brass, etc.

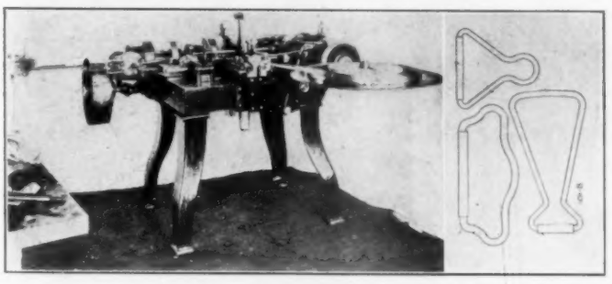
Fig. 3 shows the improved smelting furnace which has a capacity of a number 16 crucible, uses 175 cubic feet of gas per hour and will melt 40 pounds of copper in 45 minutes. This furnace is used for melting brass or refining sweepings containing gold and other precious metals.

All of these furnaces require a positive air pressure of from one to two pounds. A fan blower will not furnish this, therefore, a positive pressure blower of a compressed air system with proper appliances for reducing the air to two pounds to the square inch is necessary. A new catalogue "W. G. F.," fully describing these furnaces will be issued about March 1, 1910, copies of which may be had by addressing the Westmacott Gas Furnace Company, 161 Orange street, Providence, R. I.

"BAIRD" WIRE FORMING AND FERRULING MACHINE.

The Baird Machine Company, of Oakville, Conn., are the designers and buiders of the machine herewith illustrated, and like its predecessor the machine illustrated and described last month, this machine was the outcome of a demand for goods such as shown in the cut, like suspender loops, buckles, easel stands, etc., and it is meeting quite a range in this line.

This machine is a combination of two machines and is entirely automatic in its action, as it will take wire from the coil, straighten, feed, cut off and form the same. It takes sheet metal from a reel, cuts off, forms and attaches around the wire form as described above, a ferrule therefrom, dropping complete ferruled wire forms into a suitable receptacle at the rate of from 60 to 80 per minute according to the size and shape, no further attention being required than of keeping the machine supplied with metal and wire and removing the finished goods.



BAIRD WIRE FORMING AND FERRULING MACHINE AND ITS WORK.

As with all Baird special machinery, none but high grade materials and workmanship are used in construction. All hard working cam linings, rolls, and pins are of tool steel hardened and ground and sliding surfaces hand scraped to a bearing.

The machine is built in several sizes adapted for the variation in styles of work for which it was designed, and is proving quite a favorite machine among the novelty manufacturers. Further information regarding capacities, etc., can be obtained, together with bulletin, from the designers and builders.

SATIN FINISH PRODUCED WITH SAND BLAST.

Satin finishing is now in great demand by manufacturers of jewelry and novelties of all kinds, but up to the present time there has been great difficulty in securing uniform results with the acid method formerly in use. There is a new way of doing this work, which is more satisfactory in producing uniform results, which is cleaner, which does not require expert knowledge and which is cheaper. This method is sand blasting. The sand blast produces a satin finish which is uniform at all times. The operator cannot spoil a piece of work however much he may try, therefore a boy does just as efficient work as the most expert workman.

For sand blasting the operation may be performed by a number of different methods. There are a number of these machines now on the market, but they have one vital defect, and that is that when the machine is stopped and the sand settles to the bottom the pipes become clogged and it is only by great effort and by disconnecting the piping that operation may be continued. The sand blast machine manufactured by Leiman Bros., Brill street and Bonykamper avenue, Newark, N. J., is a new departure in machines of this character. Especial attention has been given to the system of piping employed. About a pail of ordinary sea sand or other abrasive material is poured into the machine and drops to the bottom. Then the blast of air is turned on and begins to flow down onto the sand, stirring it into a whirlwind. When the sand has been stirred up another pipe begins to suck this loosened sand, drawing it up to the nozzle where the main volume of air strikes it, projecting it upon the work with great force. After the sand strikes the work, it drops again to the bottom of the machine when it is ready to be drawn back through the same pipes over and over again. Here we have the continuous automatic sand feed by which the same sand is used repeatedly. By blowing down onto the sand and stirring it up it can be readily seen that this machine cannot clog up or get out of order.

Another very important feature: formerly when small pieces of work dropped into the machine it was necessary to disconnect the piping in order to secure it again, thereby losing a great amount of time. With this improved sand blast machine, a screen is placed across the interior to catch anything that may be dropped.

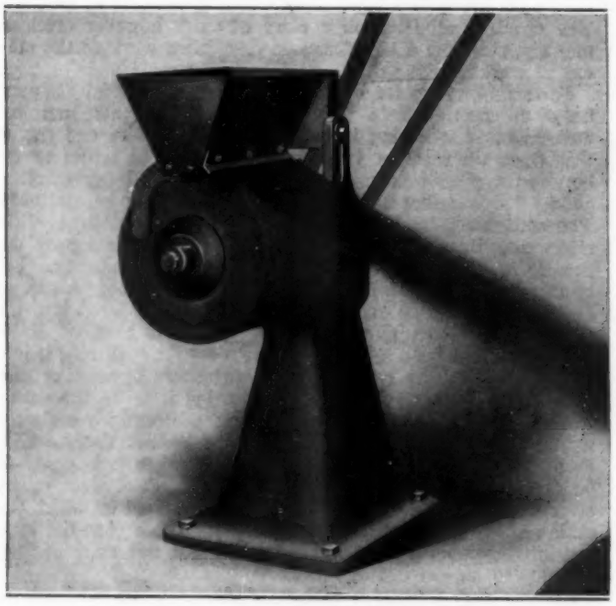
The glass at the top and sides of the machine admits light so that the progress of the work may be easily followed and the cloth cuffs on the front with their elastic bands are placed there to prevent any of the sand from coming out of the machine while in operation. One lever starts and regulates the flow of sand. In order to operate these machines a supply of air at a pressure of three to four pounds is required and this may be furnished by pressure blowers, which are manufactured by the same firm. These blowers are also used with all classes of gas appliances and full particulars regarding them, also the sand blast machines, may be obtained by writing direct to the above named concern.

LEVETT'S PATENT MULTIPLE BUFF.

This buffing wheel is constructed in such a manner as to prevent the loose threads from raveling out, and being a solid disc buff overcomes the danger of pieces flying out, and consequently wears about twice as long as the ordinary commercial buff. There is not only a saving of cotton cloth, but a saving of polishing material and labor. It is obvious if the threads don't ravel out, the polishing material is not carried away with raveled threads as is the case with the ordinary buff. It is also obvious that if the polishing material is not carried away with the raveled threads, it remains on the wheel. Hence, the buffer will not be obliged to apply the polishing material so often to the wheel, thus saving considerable time and labor. Quite a number of orders for this Multiplex Buff have been received, and in every instance the users have pronounced the wheel superior to any they have ever used. The wheel is manufactured by The Levett Manufacturing Company, 507 Canal street, New York, who will be glad to furnish any additional information desired.

A NEW SAND MIXER AND SIFTER.

The Bilz sand mixer and sifter here illustrated is designed on novel principles, its main feature being the use of a cylindrical wire brush located just below the bottom of the feed hopper and running at about 1,500 revolutions per minute. This brush draws the sand gradually from the hopper, throws it forcibly through the air and deposits it, thoroughly mixed, in a heap on the floor; while all foreign particles, such as nails, wire, wood, etc., are, on account of their heavier weight, projected still farther from the machine and deposited in a separate pile, leaving the sand perfectly mixed, all ready for use and in better condition for casting work than can be secured by hand treatment.



THE BILZ SAND MIXER AND SIFTER.

The machine is the invention of R. Bilz, foreman of the John Williams' bronze foundry at New York. The first one made was tried out in this foundry and with such success that a second was soon installed, and these two machines, attended by two men only, keep the whole foundry, in which about 100 men are employed, amply supplied with sand. The sand is brought in from the street, put through the machines and delivered to the molders so regularly that the loss of molders' time while waiting for sand, which under the old method was considerable, has been reduced to nothing. The sand, furthermore, is much finer than that formerly obtained, being about equal to sand passed through a number 16 sieve, while under the old method of hand-sieving it was with difficulty that six men could pass enough sand through number 6 or 8 sieves to keep the molders busy.

In addition to saving the time of four men, a material economy has been effected in this foundry by eliminating the cost of sieves. Other advantages are that wet French sand can be run through without drying. All danger of blood-poisoning through the molders' hands coming in contact with nails, broken wires, etc., has been removed, and better work has been made possible because the lower cost of mixing and sifting permits the use of fine sand to a depth of three or four inches from the face of the mold, instead of the usual thin layer.

The W. Bilz Sand Mixer and Sifter Company, 1314 Findlay avenue, New York, is prepared to fill orders and has already installed machines in a number of large foundries, including those of Mitchell & Vance Company, New York; Bureau Brothers, Philadelphia; A. Griffoul, Newark, N. J.; the Gorham Manufacturing Company, Providence, R. I.; the Wm. H. Jackson iron and bronze foundry, West Twenty-eighth street, New York, and Joseph Reinbold, gold, silver and bronze foundry, Newark, N. J.

VERNON METAL COMPANY'S IMPORTED ALUMINUM.

The Vernon Metal Company, 30 Church street, New York, announce that they have been improving their facilities for supplying their customers' requirements in aluminum, copper, tin, lead, spelter and autimony, and are now in a stronger position than ever to render efficient service in this line. The aluminum which they handle comes from Great Britain, France and Germany, and recent analyses of eight ingots from actual shipments gave the following results.

ALUMINUM.	IRON.	SILICON.
99.08	.49	.43
99.27	.37	.36
99.39	.24	.37
98.55	.82	.62
98.72	.75	.53
98.68	.90	.42
98.76	.92	.32
98.74	.71	.55

The Vernon Metal Company states that this grade of imported aluminum is being laid down in the United States at more than a cent pound lower than the cost of domestic aluminum alloys containing 92 to 93 per cent. pure aluminum.

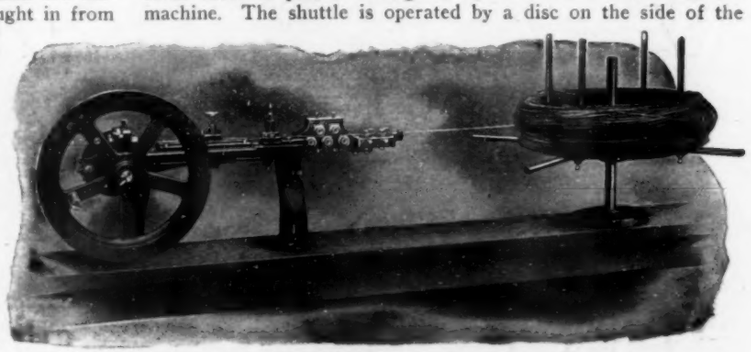
PLATERS' CLEANING COMPOUND.

The Standard Supply Company, manufacturers of plater's compound, New Haven, Conn., state that they have manufactured this compound for twenty-five years and that it displaces fish soaps and also whole oil soaps. The compound is put out with a guarantee that if it is not in every way satisfactory no charge is made and may be returned at the company's expense. The material is put up in barrels, half barrels and kegs. Samples are sent free on request.

CORE WIRE-CUTTING MACHINE.

The Gregg Manufacturing Company's No. 7 Core Wire-Cutting Machine shown in the cut is a machine which has lately been patented by them for the purpose of cutting the small core wires used in a foundry. The necessity of this machine in foundries using a large number of small core wires is very apparent, as the old way of taking the coil of wire out in the yard, running off from 100 to 150 feet, stretching until it is straight and then cutting it up in short lengths has always proved a nuisance. It was in order to overcome this that the Gregg machine was manufactured, they having had the same experience in their own foundry.

The wire is taken from the coil, fed into the straightener rolls, from there it passes through a tension into a shuttle of the machine. The shuttle is operated by a disc on the side of the



THE GREGG CORE WIRE-CUTTING MACHINE.

wheel, on which graduations are placed, making changes for various lengths very simple; as all the operator has to do is to loosen a screw and set the pointer so that the length required is shown on dial. There is a mechanism placed on the side of the machine, which allows the machine to skip one revolution in cutting thereby giving a double length wire. The machine is operated by hand, or can be run by counter shaft and will cut as many wires in one hour as two boys can cut in a whole day by the old method, the straightening, measuring and cutting being automatic. For further information interested parties should send for catalogue G7 to Gregg Manufacturing Company, 1318 West Fourth street, Cleveland, Ohio.

Associations and Societies

DIRECTORY OF AND REPORTS OF THE PROCEEDINGS OF THE METAL TRADES ORGANIZATIONS.

NATIONAL ELECTROPLATERS' ASSOCIATION OF THE UNITED STATES AND CANADA.

President, Chas. H. Proctor, Arlington, N. J.; Treasurer, Nathan S. Emery, New York, N. Y.; Secretary pro tem., Percy S. Brown. All correspondence should be addressed to the Secretary, P. S. Brown, 956 Anderson avenue, New York. The objects of the Association are to promote the dissemination of knowledge concerning the art of electro-deposition of metals in all its branches. Meets the first Saturday of each month, 8 p. m., at the Hotel Chelsea, 222 West Twenty-third street, New York City.

The twelfth regular meeting was held Feb. 5, 1910, at the Hotel Chelsea, New York. Thirty members were present and several applications for membership were received. Dr. Richard Moldenke, of Watchung, New Jersey, was elected an honorary member. The committee on the revision of the Constitution reported and a portion of the new Constitution was read and discussed. The entire Constitution, together with By-Laws, will be adopted at the annual election meeting held in April. In the meantime copies of the proposed changes will be made and sent to out-of-town members for their consideration.

FIRST ANNUAL DINNER OF THE NATIONAL ELECTROPLATERS' ASSOCIATION OF THE UNITED STATES AND CANADA, HELD AT HOTEL MARLBOROUGH, NEW YORK, JANUARY 15, 1910.

The banquet committee reported that the "Get together" dinner held Jan. 15, 1910, at the Hotel Marlborough, New York, had been an unqualified success. There was a small amount of money left over and any one who could not use his ticket may have his money refunded. We reproduce a picture taken at the dinner, with a list of the diners.

NEW YORK.—New York—Percy S. Brown, C. H. Buchanan, A. M. Clark, Clinton De Baun, Nathan E. Emory, H. Farrel, W. Fischer, W. A. Jones, Frank Kirbe, G. Kelch, Leonard Lesch, W. L. Morris, T. O'Reilly, B. Popper, Harry Scherman, Joseph Straub, Joseph Straub, Jr., William Schneider, J. A. Stremel, W. J. Turpenny, G. W. Webster. **Brooklyn**—W. Aschoff, Albert Black, C. S. Barbour, Jr., J. Brantwien, R. Cole, Joseph Dimes, F. Duffy, John Fannon, Frank Geiger, G. Haskins, Chas. A. Hopkins, P. H. Langdon, Joseph Menjes, E. Millwater, Joseph Musante, Thomas Noonan, Jr., C. A. Reama, Herman Reama, Wm. Schneider, E. W. Stephenson, Hans Weber, Wm. Voss, A. D. Havens, H. C. Bernard, J. J. Dougherty. **Binghamton**—L. E. Sturdevant. **Hurleyville**—W. Schneider. **Peekskill**—L. H. O'Donnell. **Richmond Hill**—Emil Blintner.

NEW JERSEY.—Arlington—R. Dipple, R. Goble, W. S. Gordon, A. Gordon, Chas. H. Proctor, H. R. Proctor, Edwin Proctor. **Belleville**—C. Mace. **Bloomfield**—H. H. Smith. **Camden**—S. D. Benoliel. **Glen Ridge**—A. Baumler. **Harrison**—Herman Jaeter, E. Hoffman, Arthur Bramwell. **Jersey City**—Harry J. Aims, Royal F. Clark, August Hoffman, Geo. Killian, F. Kuehmer, R. H. Sliter. **Newark**—Hugh Baxter, H. Curry, J. F. Curry, F. P. Davis, Frank Dressel, J. Farrell, J. C. Frey, L. J. Falter, Geo. Gehling, E. Gibbons, Fred Groh, John Griffin, John Hartnett, A. C. Hogaboom, Geo. B. Hogaboom, Wm. Keefe, Alex. Lennitt, Jr., Wm. Miller, J. N. Morehouse, G. E. Osborn, A. G. Peffer, C. W. Pollard, Ed Poeter, J. C. Rall, G. Reiman, Geo. Reuter, John Schmidt, Chas. Steihle, Roy Stout, Dr. A. Tessler, Emil Troxler, Samuel Taylor, A. Van Sickle, Geo. Vankowsky, A. Watts, A. Wicke. **Orange**—Geo. Cotton, E. Mullard, B. McFarland, J. H. Nie-

meyer, J. O'Connor, A. Savage, A. Warth. **Watchung**—Dr. Richard Moldenke. **Weehawken**—A. Burbott. **West Hoboken**—Thos. Haddon.

RHODE ISLAND.—Providence—H. L. Flanigan.

MICHIGAN.—Detroit—T. C. Eichstaedt.

CONNECTICUT.—Bridgeport—Stephen Masek. **New Britain**—G. A. Cartlege, Bill Schneider. **Norwich**—G. W. Slattery. **Stamford**—S. H. Graves.

The subject for discussion for the evening was Salt Water Gold Plating Solutions, and while no paper was read, Messrs. Schneider, Tessler, Bernard, Gehling, Baxter and others presented informal opinions and considerable discussion followed. Secretary Brown read a paper written by Dr. G. A. Tessler, of the Edison Phonograph Company, giving the results of his examination into the causes of the streaking, etc., of acid copper plating solutions. In the particular cases that had prompted the investigation he had found that dextrine had been added to the solution for a brightener. The dextrine was found to be impure, containing glue, which prevented the uniform deposition of the copper. He found that by adding tannic acid, he was able to precipitate the glue out as gluten tannate and after filtering off the solution obtained satisfactory results.

Percy S. Brown commented upon Dr. Tessler's paper in part as follows:

It is obvious that although Dr. Tessler's investigation satisfactorily overcame the difficulty encountered in two distinct cases it is not necessarily a cure-all and the same applies to many other investigations which have been made upon this subject. It is without doubt true that alum would not be of much use in a solution already containing an additional agent such as tannic acid, dextrine, etc., as alum is added for the same purpose as the organic agents. In other words, if alum were added to a copper sulphate solution it would tend to have the same effect as tannic acid, although it is doubtful whether it is beneficial. Inasmuch as copper sulphate is readily soluble there is no necessity for adding conducting salts, and the use of alum must be intended to cause a smooth, homogeneous copper deposit.

I would recommend that the plater study his conditions carefully whenever he encounters streaking and pitting in his deposits and that he consider his case exclusively, bearing in mind that the usual cause of pitting and streaking is too much current, which causes an evolution of hydrogen at the cathode. In connection with the current troubles, he should study the question of a proper load in relation to the current employed, the amount of copper in the solution, the proportion of free acid, the cleanliness of contacts, the anode surface and all the other conditions, which, directly or indirectly, have an effect upon the efficiency of his plating. Common sense and a little careful study of his conditions will assure every plater of overcoming his difficulties."

A short discussion followed, regarding the use of bisulphite of sodium in cyanide solution. The general opinion seemed to be that its addition was beneficial.

The secretary announced that there were on hand some of the official buttons of the association. These buttons bear the design shown in the cut in the title head of this article, and can be obtained by members for 55 cents each. Address Geo. B. Hogaboom, 656 Hunterdon avenue, Newark, N. J.

NATIONAL ASSOCIATION OF BRASS MANUFACTURERS.

President, Theo. Ahrens, Louisville, Ky.; Commissioner, William M. Webster, Chicago, Ill. All correspondence should be addressed to the Commissioner, William M. Webster, 1112 Schiller Theater Building, Chicago, Ill. The objects of the Association are to promote in all lawful ways the interests of firms engaged in the manufacture of brass goods. Meets every three months. Each meeting fixes the place and date of the meeting to follow, consequently there is no stated place. It has been customary for the Association to hold its Annual Meeting in New York City in December of each year. The Semi-Annual Meeting is generally held at Atlantic City or some other Sea Coast town. The next meeting will be held in Cleveland, O., on March 16 and 17.

The Spring Meeting of this Association will be held Wednesday and Thursday, March 16 and 17, at the Hollendon Hotel, Cleveland, Ohio.

THE CLEANING OF METAL WORK.*

By S. D. Benoliel.†

The efficient and economical cleaning of metal work of all kinds before plating, tinning, dipping, galvanizing, japanning, etc., is a more difficult problem than is generally considered by those who usually perform these operations. If the scrub brush is used the operation is an easy one but if the work is to be cleaned rapidly, with a minimum amount of work with the smallest amount of materials and without in any way affecting the finish of the metal the proposition then turns out in a great many cases to be a rather difficult one.

The proper cleaner to use depends not only on the character of the material to be removed but also on the nature of the metal to be treated and the operation that is to be performed on the metal after it is cleaned. If a piece of brass work is buffed and is to be lacquered, the cleaner must be of such a nature that it will not in any way affect the finish of the brass so that after it is cleaned the work can be immediately lacquered and still have the appearance of being properly finished.

If again a piece of iron is to be cleaned for plating the proposition is a much easier one, for most cleaners will not detrimentally affect the finish of the iron. The cleaner used in this particular case must have the property of cleaning the iron rapidly without any scouring, so that the work will be chemically clean, otherwise the metal deposited would be likely to peel off when the article is buffed. If this same piece of iron is to be cleaned between machine operations, or is to be put away in stock or be packed for shipment, the above cleaner would be entirely unsatisfactory, for it would clean the work so well that it would soon rust and produce considerable trouble.

All materials generally used for the cleaning of metal work can be divided in four classes. The first class contain those that clean by solution. The second are those that clean by emulsification. The third that clean by chemical action. The fourth that clean by mechanical action. A great many of the cleaners used really belong to more than one class. Very often it is difficult to place the cleaner in the proper class. This classification, however, will be found useful when making a systematic study of these materials.

The first class of cleaners that clean by solution act by dissolving the material on the work, the material removed dissolving in the cleaner used. To this class belongs such materials as benzine, alcohol, turpentine, carbon tetra-chloride, etc. When these cleaners are used the articles removed are not changed in composition and therefore remain distributed through the entire mass of the cleaner. Most cleaners of this kind are volatile, and it is therefore possible in a great many cases to distill off the cleaners used, which can be recovered, and the residue will then contain the articles removed. Cleaners of this kind soon become saturated with impurities and must be thrown away or recovered by distillation. Benzine, naptha and kerosene are the cleaners belonging to this group that are to a great extent in factories, cleaning metal work. They are very objectionable owing to their being inflammable, and are uneconomical, owing to their being volatile, causing considerable of the material to be lost by evaporation. They have the advantage, however, of dissolving rapidly the bulk of the material to be removed. They do not, however, clean the work sufficiently well so that the articles cleaned can be plated, tinned, lacquered, etc.

The second class of cleaners which clean by emulsification act by emulsifying or combining mechanically with the materials to be removed. To this class belong such materials as soap, soap compounds which consist of soap mixed with various chemicals, and a large variety of chemicals which do not combine chemically with the material to be removed but which nevertheless exert a cleaning action. When these cleaners are used the articles removed are not changed in composition, there being absolutely no chemical action. The material removed remains mechanically mixed throughout the entire cleaner. Cleaners of this kind soon become saturated with the matter removed and must be thrown away, but as a rule this class of materials do not become contaminated as rapidly as those belonging to the first class. They

*From an address given before the National Electro Platers' Association of the United States and Canada, at their first annual dinner at Hotel Marlborough, New York City, on Jan. 15th, 1910.

†General Manager of International Chemical Co., Camden, N. J.

are generally of a non-inflammable nature and do not therefore possess that objectionable feature of those cleaners belonging to the first class.

The third class of cleaners act chemically, combining with the material on the work, forming an entirely different substance, the new material formed going into solution. To this class belong such materials as potash, lyes, caustic soda, potassium cyanide, acids, etc., etc. An example of this kind is when a potash combines with an oil or grease, making a soap which goes into solution, the soap being of course entirely different than either the cleaner or the article removed. Most cleaners of this kind act rapidly, must be used hot, and the materials formed by chemical action on the materials to be removed do not rapidly contaminate the vat. This kind of cleaners should always be used wherever possible as they are generally the most economical in cost and the most rapid and efficient in operation. When the proper cleaner of this kind is used they generally clean the work so that they can be plated without scouring. The work, of course, has to pass through the proper dips before being ready to plate.

The fourth class of cleaners act by mechanically throwing off the material to be removed. The electrical cleaners belong to this class. The electrical current is passed through the solution and gas is given off at the work which helps the cleaning action of the solution. Materials used as electrical cleaners generally belong to one or more of the other classes. The best results are obtained when they belong to the third class, which means that they also clean by chemical action. Unfortunately most of the electrical cleaners that are used do not clean in this way, their main virtue being due to the gas that is produced at the work. Electrical cleaners are generally used hot; their main advantage is due to their cleaning work rapidly. One of the disadvantages results from the necessity of connecting them up electrically, and because they generally do not clean highly colored work made up of oxidizable metals satisfactorily, as they have a tendency to tarnish this class of work. Electrical cleaners as a rule should never be used when the work can be cleaned without the use of the current, as they complicate the cleaning operations and must be more closely watched than when ordinary dips are used. Where a large number of cleaning tanks are in operation the electrical feature is very objectionable.

SELECTING A CLEANER.

In a factory doing a large variety of work it is generally a difficult proposition to decide on the number of cleaners to be used. Where there are a number of departments, each taking care of one class of work, one is usually warranted in recommending a cleaner best adapted to the work of each department independent of the number of cleaners that would have to be used. Under these conditions the most economical and efficient results would be obtained. In the smaller factories where there is a large variety of work and where the work is all treated, say, in one room, the proposition is a much more difficult one. The material recommending must take care of several classes of work and must therefore be a compromise cleaner. The cleaner should be such as to take care in the most efficient manner of the bulk of the material cleaned. This can very often be done by introducing such modifications in the use and doctoring up of the cleaner as to take care in a fairly satisfactory manner of most of the work to be cleaned.

PERSONALS

ITEMS OF INTEREST TO THE INDIVIDUAL.

A. Van Winkle, president of The Hanson & Van Winkle Company, Newark, N. J., is at his winter home at Nassau, West Indies.

William A. Fraser, president of the Detroit Brass Works, is dead at St. Augustine, Fla., where he had gone with Mrs. Fraser to spend the winter.

Chas. M. Hall, vice-president of the Aluminum Company of America, Niagara Falls, N. Y., is spending the winter months at Pasadena, Cal. Mr. Hall is now recovering from an operation.

H. B. McGrath, Detroit, Mich., has been named as president of the Sheet Metal Contractors' Association. Frank C. Thornton is vice-president, E. E. Rudolph, treasurer, and E. F. Bohm, secretary.

William Schneider has accepted a position as foreman plater with the Colonial Art Metal Works, 465-469 West Broadway, New York City. The Colonial Company are manufacturers of fancy art metal goods novelties.

Walter H. Perkins, general superintendent of the Waterbury Manufacturing Company, Waterbury, Conn., was granted on Jan. 4, a patent on a sheet metal hose nozzle for lawn sprinkling. This nozzle this company will produce.

Dr. Richard Moldenke, secretary of the American Foundrymen's Association, sailed for Europe on Jan. 25. He was recently elected an honorary member of the National Electro-Platers' Association and spoke at their annual banquet on the subject of "Get Together."

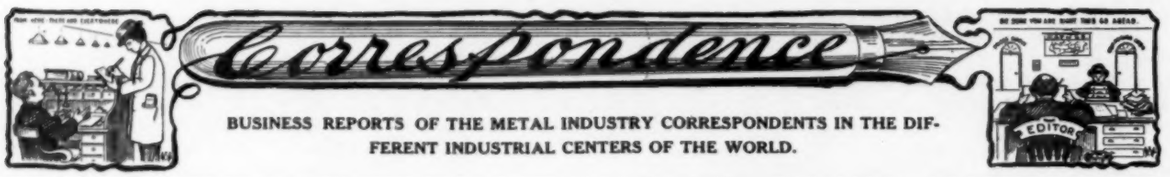
Samuel R. Beardsley, president of the Vulcan Detinning Company, New York, died suddenly Dec. 5. He had been president of the company four years. Resolutions setting forth their appreciation of his worth were adopted by the directors at a special meeting held Dec. 6.

A. A. Greenburg, who recently established the New York office for the sale of Homogen, has started for the Middle West where he will look after the sales of Homogen in that section of the country and shortly open a Chicago office. Mr. Greenburg reports that Homogen is meeting with great success everywhere. It has already been described in THE METAL INDUSTRY and is a flux for melting brass.

Dr. Edward G. Acheson, president of the Acheson Graphite Company, Niagara Falls, N. Y., was presented with the "Perkin medal," a gold decoration awarded annually "to the American chemist who has accomplished the most valuable work in applied chemistry during his career," by the Chemical Club, Jan. 21, at 108 West Fifty-fifth street, Manhattan. The award to Dr. Acheson was made Dec. 13, 1909, by unanimous vote of the Society of Chemical Industries.

Frank Slade, president of the Rome Tubing Company, manufacturers of small size copper and brass tubing, which recently moved from Pawtucket, R. I., to Rome, New York, has resigned. Mr. Slade's stock in the company has been purchased by Barton Hazleton, secretary and treasurer of the Rome Brass and Copper Company, and James A. Sparga, president of the Spargo Wire Cloth Company, both of Rome. No successor to Mr. Slade has yet been selected.

Julian R. Holly was made president, as well as treasurer and general manager, at the annual meeting of The Bristol Brass Company, Bristol, Conn. Alexander Harper was elected to the newly created office of assistant general manager. Albert F. Rockwell and William S. Ingraham were elected to the board of directors, the other members being Henry F. English and Dean Welch, New Haven, Conn.; Julian R. Holley, George W. Mitchell, Samuel B. Harper, Roger S. Newell, Charles T. Treadway, all of Bristol, and Charles W. Gross, of Hartford, Conn.; Henry F. English was elected vice-president, and Samuel B. Harper secretary and assistant treasurer.



BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS IN THE DIFFERENT INDUSTRIAL CENTERS OF THE WORLD.

WATERBURY, CONN.

FEBRUARY 10, 1910.

As Charles F. Brooker, the president of the American Brass Company, put it in a recent interview given out in Washington, D. C., "business is good and there is every indication that it will continue so." That is, in a nutshell, the situation here. It was so good with several of the Waterbury manufacturers that instead of the usual week, only one or two days were allowed at New Year's for a shut-down to take the annual or semi-annual inventory. At the same time the spirit here is conservative and while there is plenty of work the foremen are hiring only men who are seeking permanent employment. There are but few unemployed in the city and practically none who have had any experience in any branch of the metal manufacturing business.

In the plants of the American Brass Company there is much activity in all departments and the amount of freight in and out for and from this corporation continues to be large enough to keep the full force of the railroad yards busy, with the regular shipments of other factories and the merchants. The city is holding fast to the reputation it started after a few years ago, of being the largest freight shipping point on the New Haven road's system, through the prosperity of its shops.

In the rolling mills all hands are busy and it was a matter of much annoyance to the company when a large portion of the rolling force had to lay off for a day the middle of last month on account of the flooding of the engine room after a heavy rain storm. The damage was found to be slight. Both the Benedict & Burnham and the Waterbury Brass Company's plants are running with full day forces and partial forces at night.

At the Chase Rolling Mills Company's plant there is great activity, especially in the rolling departments, and this of course means activity in practically every other branch. The plant is running with full force and a large number of hands are putting in overtime four nights a week, some working all night.

At the Scovill Manufacturing Company's plant there is the same activity that characterized that hive of industry during the fall months with a hardly perceptible slackening due to the usual lull at this period. There are plenty of orders on hand for small and large goods and the novelty line seems to be thriving.

The Randolph-Clowes Company, the Waterbury Farrell Foundry and Machine Company, the Waterbury Rolling Mills Company and the several smaller foundries are running full time, while the machine shops and manufacturers of tools, crucibles, and special machinery all report prosperous conditions and good outlook.

Perhaps the most dubious at the beginning of the past year was that of the clock and watch industry. This is not among the first usually to recover from panics, but combinations of circumstances brought things out all right for the Brass City's shops. The "dollar watch" campaign of the Ingersolls in foreign markets put the plant of the Waterbury Clock Company to its best efforts and after a few months of gradual increase the orders came for an output amounting to about 12,000 watches daily, covering the major portion of the year. That condition still prevails. The new England Watch Company had a less speedy recovery and many rumors were started as to changes and the closing of certain departments, but this well-established, strongly capitalized corporation went stolidly along and closed the year with a fairly good record and a busier shop than it has had in two years. It is now running steadily and vigorously, and, while it was not compelled to cut short its usual holiday vacation when inventory is taken, it will reopen with bright prospects and plenty of work. Its normal force of between 300 and 400 employees has been kept on throughout the greater part of the year and the prospects for an increase to 500 or more in the near future are good. The Bannatyne Watch Company, the infant of the watch concerns here, has gone along well and seems to be in shape for continued prosperity, although some wiseacres fear a bitter war against the independents on the part of the "trust" in the course of a few months and predict trouble for all the younger watch concerns of the country.

Pianos were wont to be considered among the luxuries at one time but their manufacture seems to have boomed all year, for the piano hardware makers here have been kept hustling to fill orders and are still. The Plume & Atwood Manufacturing Company, with its big plants here and at Thomaston, have been compelled to add overtime and extra men in both places and have numerous orders still unfilled with good prospects ahead.

Novelty manufacturers have been parties to similar conditions and, while not so marked, prosperity favored them early in the year and they closed strong and are optimistic. The smaller concerns have had much new business and the novelty manufacturing departments of the American Brass, the Scovill and the Waterbury Manufacturing Companies (Chase's) plants have boomed. Not a little of the work has been on new inventions of cheaper goods which have found the markets favorable, while such products as household hardware and utensils, bathroom fixtures, automobile trimmings and the like have been turned out fast for generous, well-paying orders.

Expansion has been marked in the various industries. Thousands of square feet have been added to the Scovill plant, the Chase Rolling Mill and Waterbury Manufacturing Company's plants, as well as to those of the Waterbury Clock Company, the Oakville Company, the Blake and Johnson Company. Smaller additions have been made by some of the other concerns and the American Brass Company has been stretching its elbows in the new buildings it added to its equipment before the year began and readjusting its various departments according to its plan of greater economy of space and time. The contracts for new factory buildings here have amounted to upwards of $500,000 and the end is not yet.

From wire drawing to armor and heavy machinery, from rolled and sheet brass to novelties and buttons, Waterbury's products have gradually won back the trade and the year just begun gives promise of new records in output, profits and increased payrolls in practically every line.

Collections have been a bit slow, but on the whole the conditions in this respect are not of much value to the pessimists.—F. B. F.

PROVIDENCE, R. I.

FEBRUARY 10, 1910.

The present moment finds the manufacturers of almost all grades of jewelry on the anxious seat waiting for the spring trade to get into its full stride. Although none of the manufacturers have lost any of their optimism over the outlook for the year, the majority of them are willing to admit that the spring trade has not opened with quite the degree of buoyancy they expected. They are of the opinion, however, that the opening is merely deferred and that a few weeks will soon see the wheels of their factories groaning under all the work they can carry.

The manufacturers of stock are especially busy just now. The influence of the coming spring trade reached them some time ago and they are now hard at work getting out stock for the manufacturers who later will make the finished product. The makers of the highest grades of gold ware are usually quite dull throughout the spring and they are not expecting much change this year. Their outlook for the opening months of the year is somewhat brighter than the opening months of the past year or two but not so much so as to give any great cause for rejoicing. This class of goods is turned out in great quantities in the fall and a heavy trade is expected when the fall rush starts in. The manufacturers of the cheaper grades of jewelry generally report a bright outlook for the next few months. Orders are coming in in substantial quantities and increasing volume. The refiners as a rule predict an exceptionally fine spring.

A significant event in the silverware industry in the East was

the decision at a special meeting of the Silversmiths Company held at the Gorham Manufacturing Company's plant in this city a few days ago to increase the quarterly dividend from one per cent. to one and one-quarter per cent. Secretary Lawton said this action was taken because of the increased prosperity throughout the country and that the demand for a better grade of goods had made the past year's business of such a profitable character that the increase in the business was warranted. The quarterly dividends from the time of the formation of the Silversmiths Company, which is the holding company of practically all of the large silversmithing establishments in this country, up to the annual meeting in April of last year, was 1½ per cent. At that time it was decided that conditions of business called for the reduction of the dividend to 1 per cent.

Speaking of business conditions, Secretary Lawton said that the outlook of the Gorham Manufacturing Company, which is included in the Silversmiths Company, never was better. There is so much work on hand that the usual shut-down for stock taking, which comes early in February, was reduced this year from two weeks to one week. The rush in the bronze department has been so great and so many large pieces are waiting to be completed that this department did not shut down at all.

The principal item of interest in the calendar of the Manufacturing Jewelers' and Silversmiths' Association is the visit which President Taft will make to this city to address the association on the evening of Monday, March 21. The President will speak at the mid-winter banquet of the association. In view of the great demand for tickets, every inch of available space in Infantry Hall will be requisitioned. Senator Nelson W. Aldrich and Senator George Peabody Wetmore are also expected to be present and speak.

The annual meeting of the Manufacturing Jewelers' Board of Trade was held Jan. 22. The following directors were elected: Robert E. Budlong, of S. K. Merrill Company; William P. Chapin, of Chapin & Hollister Company; Everett L. Spencer, of E. L. Spencer Company; Edward B. Hough, of Wightman & Hough Company; Alfred K. Potter, of E. A. Potter Company; L. H. Bosworth, of Potter & Buffington Company; George H. Holmes, of George H. Holmes Company; Fred D. Carr, of Ostby & Barton Company; Frederick A. Ballou, of B. A. Ballou & Company, Inc.; Harry Wolcott, of Wolcott Manufacturing Company; William T. Chase, of C. H. Cooke Company; Charles A. Russell, of Irons & Russell; and Horace W. Steere, of Arnold & Steere, all of this city; Herbert C. Bliss, of Bliss Company; C. J. McClatchey, of Horton, Angell Company; Harold E. Sweet, of R. F. Simmons Company; E. L. Gowen, of the Standard Button Company; Maurice J. Baer, of the Attleboro Manufacturing Company, all of Attleboro; George A. Whiting, of Sturtevant & Whiting; G. H. French, of W. & S. Blackington Company; Ira Barrows, of the H. F. Barrows Company, all of North Attleboro; Woodbury Melcher, of Schoefield, Melcher and Schofield, of Plainville; Fred E. Sturdy, of J. F. Sturdy's Sons Company, of Attleboro Falls; John W. Pickering, of Pickering, Metcalf Company, of Leominster, Mass; Henry Untermeyer, of Charles Keller & Company, of New York.

At the conclusion of the meeting the new directors organized as follows: President, Fred D. Carr; first vice-president, Charles A. Russell; second vice-president, Herbert C. Bliss; secretary and treasurer, Marcus W. Morton; manager, Horace M. Peck; executive committee, Fred D. Carr, Everett L. Spencer and Alfred K. Potter; auditing committee, C. J. McClatchey, L. M. Bosworth and Edward B. Hough.—E. S. U.

BRIDGEPORT, CONN.

FEBRUARY, 10, 1910.

There has been no sudden change in the business conditions in the metal industries of this city during the last few months. There has, however, been a steady and gradual upward movement in the trade generally. In one or two lines of manufacturing the improvement is more marked, necessitating the working of an increasing number of hours and the construction of some additional buildings in order to keep pace with the orders that are to be filled.

The protracted period of depression has had a salutary effect upon the laboring class, as a whole. There is at present no unrest among the employees of the large manufacturing concerns. They are now anxious to recoup their fortunes, many of them having suffered heavily during the dull times, and the memory of privation is still fresh in their minds. There is on the part of the employers a better attitude toward their men, and an effort is being made in some cases to stand between the employees and the high rates of living that prevail. The Crane Valve Company is making a practical effort in this direction, by planning the construction in one of the most desirable parts of the city of a colony of modern workmens' cottages, to be known as "Craneville," which will, it is planned, contain some 100 or more buildings. This company has been instrumental in bringing many out of town employees to this city, and is engendering good feeling by their efforts to care for them. They have also provided reading room facilities and other opportunities for entertainment during lunch hour.

The Whiting Manufacturing Company, makers of silverware, are removing their plant from New York to this city. They have their building on the east side of the city almost completed, and will start work in a short time. They are to employ about 150 hands, many of whom will come from New York and other places. The company has a very fine location for its factory on the main line of the railroad.

The unprecedented rush of orders for automobiles, coming to this city from all parts of the United States, together with the foreign countries, means, of course, business for aluminum, brass and other factories. The Locomobile Company of America is working much overtime in order to keep up with the demand for 1910 machines.

The Bridgeport Brass Company reports a steady market for their goods and that all departments are working full time.

The International Silver Company, whose headquarters are in Meriden, Conn., reports business good in all its lines and a bright outlook for the future.

Jennings Bros. Mfg. Company is employing their full force, though the chief product of their factory is not put on the market until the Christmas season again approaches. They are making a large quantity of gun metal ornaments in advance for the holiday sales and are hopeful for the future.

Night work is required of the employees of the Fairfield Aluminum Company to fill the orders sent in by some of the automobile concerns. The rush for 1910 and 1911 cars has been very great and the firm is a few weeks behind in their orders now. Business has nearly doubled in the last month and it will be March before a let-up will be in sight.

"Made in Bridgeport" has become a recognized label on much of the manufactured products being exported to foreign countries, and the publicity backed up by unquestionable merit, is resulting in an expansion in many lines.—E. L. H.

PHILADELPHIA, PA.

FEBRUARY 10, 1910.

General trade conditions in Philadelphia have shown very marked improvement within the past thirty days. The unusual volume of business incident to Christmas vastly benefitted the jewelers and silversmiths and really created a surprising demand for small goods at a time where, in the ordinary course, there would be no call for this ware. The collections for the month were exceedingly good, according to the reports of both Dun and Bradstreet, and the Bank clearings indicate a growing volume of ready money.

Mr. Leslie W. Miller, principal of the School of Industrial Arts, offers a remarkable, and probably original, suggestion as to why American made bronzes are not in such great demand as the bronzes made in Japan. With singular frankness Mr. Miller asserts that our bronzes are not in great demand because they are not artistic, no person who appreciates a fine bronze wants those made in this country and he proposed that the duty be taken off all imported bronzes until American artisans shall acquire the skill to compete with Japan in artistic designs and in practical workmanship. "Now," says Mr. Miller, "We shall never know how to make anything of this kind until we learn; and until the minds of our captains of industry are diverted, at least part of the time, from the everlasting tariff and focussed on the problem of developing industrial intelligence, taste and skill in the American workman.

"We hear a whole lot about the terrible German. Let us not

forget that it was a German, Mr. Rouleaux, who, when he was Commissioner at the Centennial Exhibition, told his countrymen that their work was at a disadvantage because it was 'cheap and nasty,' and that the beginning of commercial wisdom in Germany was when his countrymen took his statement to heart instead of getting mad about it, as we do when anybody tells us the same thing. We, in America, must produce better goods in metal and in fabrics; better in artistic conception, better in mechanical execution and better in distribution and the world will be our market and we can batter down the tariff wall on everything that can be called Art in commerce."

A Suit involving $250,000 and charges and counter charges between the Wetherill Finished Castings Company of this city and the Buick Automobile Company of Detroit, Mich., has been placed upon the record here. Another suit, involving the same parties in the sum of $100,000 has been begun in Detroit with similar allegations and it will require judicial action to determine which party to the litigation is right and how much the one in error must pay. The Wetherills are plaintiffs in Detroit and defendants in Philadelphia. The suits grow out of a contract for white brass finishings which the Wetherill company was to furnish the automobile manufacturers.

The city of Philadelphia has supplemented the work of the Board of Education in the matter of caring for the teeth of the poor and it is proposed to establish a dental laboratory in the center of the city where all manner of dental work will be performed by dentists employed for the purpose by the Department of Health. Dr. Thomas J. Byrne, of No. 1641 North Thirteenth street, who is a professor of dentistry at the Medico-Chirurgical College, advocates the use of aluminum in this work. Dr. Byrne asserts that in all fine dental work calling for the use of metal, aluminum is the coming material and asserts that where it can be used at all, it is far better in every way than any other metal used in the dental art.

Lead in very large quantities has been discovered in Pennsylvania, if the preliminary reports submitted by reputable engineers are borne out by more elaborate borings soon to be made. For obvious reasons the exact location of the deposit has not been revealed but the samples submitted and the character of those concerned tend to create confidence in the report—C. H. C.

CLEVELAND, OHIO.

FEBRUARY 10, 1910.

Business is running along in an even channel in Cleveland this month, not much difference being noted to January. It is a stock manufacturing period with most of the manufacturers in this district. The auto factories are all at work turning out new models which won't be sold until next summer, the aluminum foundries are turning out huge quantities of supplies for these auto factories, while the plumbing fixture concerns are also laying in large stocks of brass and other goods in anticipation of a big building season during the coming summer.

Two automobile shows are to be held in Cleveland this year, one on Feb. 19 and another on March 5. All the local factories are preparing to enter in one or the other shows. Models are being gotten up, some of them elaborately plated, for exhibition purposes. The auto business continues to expand with phenomenal proportions, and the Cleveland factories are all running full blast.

Several of the big plumbing fixture concerns are preparing to enlarge their plants during the approaching spring and summer. Cleveland has assumed the lead in this line of industry and does an immense amount of business each year. The manufacturers say that a big increase is shown in the call for plumbing supplies in the small towns and rural districts, indicating that the idea of sanitation is rapidly spreading. Farmers now have fully equipped bathrooms in their homes just as their city brethren have.

DETROIT, MICH.

FEBRUARY 10, 1910.

Every brass and aluminum manufacturer in the city is thoroughly convinced that the present period of prosperity is here to stay and is bending his efforts to keep up with the constantly increasing trade. Business has been vigorous for months and the one handicap that has been irritating manufacturers in every line of trade here has practically been overcome—the scarcity of cars for shipping products. Coal is also more plentiful and the threatened famine in this line has practically disappeared.

Unusual activity is noted at every brass and aluminum manufacturing establishment in the city. The general brass and aluminum trade throughout the country, and for that matter throughout the world, is at a high tide. Factories in the city are working every man they can use to advantage. This is especially true in those institutions that are making brass and aluminum automobile parts. These factories are paying the highest wage and the demand for skilled mechanics has become so pressing that manufacturers in other lines of business outside the brass and aluminum trade are complaining that they are unable to keep their men, who, in large numbers, are induced to seek employment in the brass factories. It is claimed the brass factories are paying better wages because of the great profits made from the manufacture of automobile parts. Even under present conditions the local brass and aluminum manufacturers are unable to supply the demand from the forty or more automobile factories located in Detroit and the surrounding suburbs.

S. O. Johnson, of the Pemberthy Injector Company, expresses the greatest enthusiasm regarding the present business outlook. This is one of the largest institutions of the kind in the world and its products are shipped to every civilized country. Mr. Johnson declares that his agents are flooding the plant with orders. Mr. Johnson finds when the brass business is good in the United States it is also good in the foreign countries. This factory is running to its full capacity and thus far has been able to meet every demand promptly.

In two weeks the Allyne Brass Foundry Company will enter its new factory on the east side of the city, where for months it has been erecting the greatest plant of the kind in the world. No modern device is lacking in this great factory. One thousand men will be employed here and the principal output will be brass and aluminum automobile parts. Every motor factory in the city is anxious for this concern to begin running at full capacity in order that it may be easier to secure these supplies. At present a large amount of this work is being done in surrounding cities, notwithstanding the fact that scores of brass and aluminum factories in different parts of Detroit and suburbs are producing large quantities of these necessities. The Aluminum Brass Foundry Company will also be the best equipped concern of the kind in the country for doing general jobbing work in aluminum. Nothing but the most encouraging words come from the managers of the different departments. When the new plant is in full operation it will prove a surprise to the general brass and aluminum world.

Secretary Whirl, of the Employers' Association, declares that business conditions in the brass and aluminum field during the past month has exceeded all expectations and that the outlook for the future was never brighter than they are today. Every factory in the city he declares is working full time and many of them are forced to work over time.

One of the new manufacturing firms that will soon locate in Wyandotte, a suburb of Detroit, is the Whistler Company, a concern devoted to the manufacture of electric light equipment for automobiles. A new factory will be erected at Mulbury and Third street and employ one hundred men. The pay roll is expected to be $50,000 each month. This concern is given free water, electric power, are exempted from taxation for a period of five years. A large part of the equipment produced by this concern consists of brass and aluminum.

The Ford Automobile Company has, during the past month, moved into its new factory in Highland Park. This plant has been in the process of construction for a long time and is one of the largest and best equipped of any in the country. The plant covers three city blocks, the buildings being entirely of concrete and glass. The Ford people expect to produce great quantities of brass and aluminum automobile parts in this plant, and will increase its force of men. This is one of the biggest automobile plants in the country, the cars being shipped to all parts of the world. Its trade has been heavy in Russia, Siberia and China during the past few years.—F. J. H.

TRADE NEWS

TRADE NEWS OF INTEREST DESIRED FROM ALL OF OUR READERS. ADDRESS THE METAL INDUSTRY, 99 JOHN STREET, NEW YORK

The Huntington Stove and Foundry Company, Hunting, W. Va., are contemplating the installation of a plating room.

W. P. Collins, 1640 Clay street, San Francisco, Cal., reports that he is going into the manufacture of plumbing and hardware specialties.

The Rockwell Furnace Company, New York, have been obliged to add a night shift to the force at their Jersey City factory, in order to keep up with their orders.

Rothschild & Kimo, of West Twenty-fifth street, New York, are about to install a plant for plating and coloring of the various kinds of buttons which they manufacture.

Those interested in the tinning of cast iron may obtain information about a new patented process by addressing Box 871, New Britain, Conn. Agents are wanted to introduce the process to the trade.

The Finished Parts Manufacturing Company, 68 Orchard street, Newark, N. J., is busy on large orders for die castings. They report having made very satisfactory progress since the establishment, over a year ago, of their present plant.

W. W. F. Kienzle Manufacturing Company, Chicago, Ill., manufacturers of fine saddlery hardware and hand platers for automobile irons, has changed its name to Kienzle & Kuhles. Mr. Kuhles has been in the employ of Mr. Kienzle for over 18 years, being manager of the firm for the past four years.

The published report that the Wolverine Brass Works, manufacturers of high grade plumbing specialties, of Grand Rapids, Mich., were about to build an addition to their plant is denied by H. C. Cornelius, secretary and treasurer, who states that they do not have in mind any additions or alterations for some time to come.

The Central Metal Works has been established in Harrisburg, Pa. The concern occupies a two-story brick building which was especially erected for the purpose. The works will be devoted to the manufacturing of all kinds of brass and bronze metal castings and finishing. The plant has been equipped with the most modern machinery.

The report in the current press that the Kettler Brass Manufacturing Company, Houston, Texas, is about to build an addition to its plant is stated to be an error by Thomas C. White, secretary and treasurer of the Kettler Brass Manufacturing Company. He states that while the company has in contemplation some such plans, it does not anticipate the erection of the building during this year.

E. Espana will sail for Paris, France, on Feb. 19. For the past year he has been in the United States rebuying the patents on the French molding machine built and sold by Ph. Bonvillain and E. Ronceray, of Paris. This molding machine was first exhibited in this country at the Philadelphia Foundrymen's Convention of May, 1907, and the American rights were procured at that time by the E. H. Mumford Company, of Philadelphia, which concern has since become the Mumford Machine Molding Company, Plainfield, N. J., and has relinquished their rights in the French machine. Ph. Bonvillain and E. Ronceray now offer for sale the patents and rights in the United States. There are 2,500 of the molding machines in operation in Europe; also a number in Mexico and South America. The machine attracted a great deal of attention at the Philadelphia convention. Further particulars of it and the terms for the sale of the patent rights may be obtained from Ph. Bonvillain and E. Ronceray, 9 Rue des Envierges, Paris, France.

ELECTIONS

The officers of the Waterbury Rolling Mills, Inc., of Waterbury, Conn, are now as follows: President, A. H. Wells; vice-president, R. D. Somers; secretary and assistant treasurer, F. B. Beardsley; treasurer, F. P. Welton.

Annual election meetings held during January by a number of Waterbury, Conn., brass corporations, resulted in no changes in the active management, as published in THE METAL INDUSTRY for January in an article entitled "The Brass Trade in the Naugatuck Valley."

The officers of the Coe Brass Manufacturing Company, Torrington, Conn., for the year 1910 are: President, Charles F. Brooker, Ansonia; vice-president, James A. Doughty; treasurer, Elisha J. Steele; secretary, George H. Turner; directors—Charles F. Brooker, Ansonia; James A. Doughty and Elisha J. Steele, Torrington; Adelbert P. Hine, James S. Elton and John P. Elton, Waterbury.

At the annual meeting of the American Brass Company held Feb. 1, 1910, at Waterbury, Conn., the following officers were elected: President, Charles F. Brooker; first vice-president, Edward L. Frisbie, Jr.; second vice-president, Alfred A. Cowles; third vice-president, James S. Elton; treasurer, John P. Elton; secretary, Gordon W. Burnham; assistant secretary, James A. Doughty. At the meeting of the stockholders held before the meeting of the directors two new directors were chosen. John E. Wayland succeeds his father, Chandler Wayland, resigned, and A. P. Hine succeeds the late Edward T. Coe. The list of directors is: Charles F. Brooker, A. A. Cowles, James S. Elton, John P. Elton, Arthur C. James, John E. Wayland, C. H. Dodge, James A. Doughty, John J. Sinclair, A. P. Hine, Edward L. Frisbie, Jr., C. W. Burnham, T. B. Burnham, T. B. Kent and Edward Holbrook.

ORGANIZATIONS

A reorganization is now taking place in the Hawley Down Draft Furnace Company, of Chicago, Ill., but the president, C. E. Bleyer, announces that it will not affect the present standing of the company. Frederick E. Ringer, the company's New York agent, has resigned.

The Mumford Molding Machine Company, Philadelphia, Pa., has been organized, and will sell the foundry molding machines heretofore sold by the E. H. Mumford Company, of Philadelphia, Pa. These well known molding machines will be manufactured by the Q. M. S. Company for the new company at Plainfield, N. J., and the Mumford Molding Machine Company will have its sales office at 30 Church street, New York City, with funds ample for the proper handling of its business. W. D. Sargent is president and E. H. Mumford vice-president and general manager of the new company.

INCORPORATIONS

THE CONNECTICUT MANUFACTURING COMPANY, Waterbury, Conn., manufacturers of metal goods. Incorporators: Charles H. Swenson, A. H. Osborne, John Swenson.

THE ZINC COAT SALES COMPANY, Rochester, N. Y. To manu-

facture galvanized or zinc coated metals; capital, $10,000. Directors: Benjamin F. Weaver, Simon J. Weaver, Fred A. Cully.

THE COMSTOCK-WELLMAN BRONZE COMPANY, Cleveland, Ohio. To manufacture brass and bronze castings; capital, $20,000. Incorporators: C. W. Comstock, L. W. Comstock, S. T. Wellman, F. S. Wellman, J. A. Wellman.

THE BUFFALO URANIUMITE COMPANY, of Buffalo, N. Y., manufacturers and dealers in metal alloys of all kinds. Capital, $25,000. Incorporators: Wm. L. Bechtold, John H. Smith and Arthur H. Hunter, all of Buffalo.

CHANGE OF FIRMS

Wm. F. Tanner, one of the partners in the Capital City Plating Works, Albany, N. Y., has retired and the business will be carried on as before by Joseph Bertrand, who is now the sole owner.

FINANCIAL

The Oakville Company, Watertown, Conn., manufacturers of brass goods, has increased its capital stock from $300,000 to $600,000. The company will carry out an extensive programme of expansion.

The Pratt and Whitney Company, Trenton, N. J., a subsidiary of the Niles-Bement-Pond Company, manufacturers of heavy metal working machinery, cranes, etc., have increased their capital from $2,750,000 to $4,000,000. R. C. McKinney is president, and C. L. Cornell secretary.

The Homer D. Bronson Company, Beacon Falls, Mass., has been reorganized and the capital stock increased from $30,000 to $100,000. The president, Joseph H. Woodward, of Waterbury, who until recently was secretary of the Waterbury Brass Corporation, has associated himself with Carlisle B. Tuttle, secretary, and these two, with John Booth Burrall, of Waterbury, are the board of directors, the Waterbury men having acquired control of the company. The Bronson Company manufacture piano, organ and other small hinges as a specialty and also manufacture other small brass and bronze goods. The new owners while they will continue the business along the same lines, purpose enlarging and expanding in the near future.

The Aluminum Company of America, Pittsburg, Pa., have declared a stock dividend of 500 per cent. and have increased their capital from $3,200,000 to $25,000,000. This is the second stock dividend that has been issued by this company, the first being in 1904 when the company presented the stockholders with a 100 per cent. stock dividend in common stock. The Aluminum Company of America makes the announcement that the company is to hereafter depend upon a large volume of business at lower prices for the aluminum that is produced without the protection of patents. Now that the patents governing the production of aluminum have expired, the outlook is that aluminum will take a much larger part in the list of metals used in this country. A large contract was recently received from the Hydro-Electric Commission of Ontario for 1,500,000 pounds of aluminum wire, the total cost of the order being $400,000. The wire is ½ inch in diameter and is for power lines supplied from Niagara Falls and will furnish Toronto, Windsor, St. Catherine, etc.

BUSINESS TROUBLES

The Metal Art Company, of Philadelphia, has made an assignment for the benefit of creditors to Clarence J. Buckman, an attorney. The liabilities of the company exceed $20,000. No real estate was conveyed by the assignment.

DISSOLUTION.

The stockholders of the O. H. Jones Company, a corporation organized under the laws of the State of Connecticut, located at Hartford, have agreed that the corporate existence of said corporation be terminated and that the directors act as trustees to wind up the business of the corporation. All persons owing the corporation are requested to make payment at once. Four months from and after Feb. 1, 1910, is hereby limited for the presentation of claims and creditors are warned to present their claims during the time limited to the O. H. Jones Company, Albert Blochmann, trustee, at the company's office in Hockanum, Conn., or P. O. Box 27, Hartford, Conn.

The notice is signed by the directors and John F. Forward, attorney for the directors.

REMOVALS

The Barnhart Type Foundry Company are now in their new home at the corner of William and Frankfort streets, New York City.

Max Schweiger, the well-known metal etcher, has moved his place of business from 113 Kossuth street to 230 North avenue, Bridgeport, Conn.

C. Drucklieb, New York, manufacturer of sand blasts, has removed his office from 132 Reade street to 178 Washington street, corner of Dey street.

The Metropolitan Aluminum Company, manufacturers of aluminum novelties, New York City, have removed from 182 West Houston street to 291-293 Seventh avenue.

The Glove Metal Company, of Chicago, Ill., annonuce that about May 1 they will occupy their new smelting plant at Clybourn avenue and Clybourn place. The plant covers 140 x 125 feet and is of steel and fireproof construction, with a track the full length of the property.

The new location of the Herbert H. Jackson Company, manufacturing gold and silversmiths, of Oakland, Cal., is now 355 Thirteenth street. This has been found necessary owing to the rapid increase of business. H. H. Jackson reports that they now have increased facilities in every department and are installing an up-to-date outfit with a competent Eastern man in charge, and they are also equipped for the manufacture of new work.

The American Sanitary Manufacturing Company, of Detroit, Mich., incorporated under the laws of the State of Michigan for $40,000, are transferring their plant to Abingdon, Ill., where they will reincorporate with a paid-up capital of $60,000. The plans are now about ready for the buildings, which will be a foundry building 90x50, and a machine shop 50x160 feet, two stories. When in full operation the plant will employ between 75 and 100 people. It is expected to have the plant in operation by April 1, 1910.

A. L. Taylor & Co., San Francisco, Cal., manufacturers of engineering and high temperature specialties, are now installed in their new quarters in the Hooker and Lent Building, 503 Market street, and report that the new year has started out well with business in their line. A. L. Taylor, of the company, was for many years treasurer and vice-president of the W. T. Garratt Company and previous to the great fire, under the firm style of Fair, Taylor & Co., bought out the business of the late Seymour R. Church, all of these firms being in the same line of business.

PRINTED MATTER

THE CONSOLIDATED PRESS AND TOOL COMPANY, manufacturers of power presses, Hastings, Mich., have issued their monthly calendar No. 10. This card like the others preceding it is surmounted by a handsome art photograph.

STANDARD TYPES OF EXCEPTIONAL QUALITY. A 30-page pamphlet has been issued by Barnhart Bros. & Spindler, 183-187 Monroe street, Chicago, Ill. This publication describes and gives sample displays of the various types, and specimens of printers' furniture manufactured by this company.

ALUMINUM, ALLOYS OF ALUMINUM, SILICON COPPER, MANGANESE COPPER, ETC., are products of the Electric Smelting and Aluminum Company, Lockport, N. Y., which are enumerated on a calendar card just issued by this company. A photogravure in brown tints adorn the top of the card while a neat calendar pad occupies a special space below.

RUSTPROOF NICKELING, ZINC PLATING AND CLEANING BY ELECTRICITY is a small 12-page booklet issued by The American Electro-Chemical Company, Chicago, Ill., and written by John Nelson. The booklet gives valuable information and formulæ for buffing and plating nickel and zinc, galvanizing, finishing and electro-cleaning, and is sent free upon request.

THE SHERARDIZING MAGAZINE.—The first and second numbers of Volume I, of this magazine, which is an anti-trust periodical, have just been published by the United States Sherardizing Company, New Castle, Pa. The magazine in the nature of a house organ is issued in the interest of the sherardizing process. The various advantages of this process are set forth in these numbers which can be obtained upon request.

The Obermayer Bulletin for January contains the usual number of interesting articles on foundry practice. We understand that the Obermayer Bulletin of foundry information will be published monthly during 1910 instead of bi-monthly as formerly. Any of our readers who desire a copy can have one by addressing the Obermayer Company, manufacturers of foundry material and supplies, at either their Cincinnati, Chicago or Pittsburg offices.

METALS.—A neat little brochure of 24 pages, issued by I. Shonberg, manufacturer of white metal alloys, of 363 Hudson avenue, Brooklyn, N. Y., gives a list of successful formulas employed by him. The booklet also describes the various metals made and the uses for which they are adapted, and also contains the New York Testing Laboratory reports of transverse and compression tests of the various alloys. This book may be had by applying for catalogue "S."

BRITANNIA METAL. The Standard Rolling Mills, 363 Hudson avenue, Brooklyn, N. Y., are sending to the trade desk blotters descriptive of their products. This mill makes a specialty of rolling Britannia, and "Black" metals. Sheet block tin and soda fountain linings, also high grade music plates. This concern is also distributing a calendar which is particularly useful on account of the large plain date figures. Any user of Britannia or soft metals is invited to send for one of them.

ENGINEERING DIGEST with the February number has been consolidated with INDUSTRIAL ENGINEERING, formerly published in Pittsburgh, Pa. The new magazine is called INDUSTRIAL ENGINEERING AND THE ENGINEERING DIGEST. Robert T. Kent, former editor of the INDUSTRIAL ENGINEERING becomes managing editor of the new journal, and Harwood Frost, founder of the DIGEST and one of the editors, retires from the staff. The magazine will be published at 220 Broadway, New York.

NIGHT LOCK. The 8-page folder gives a very interesting description of the "Yale 90," a new and highly ingenious Yale night lock manufactured by the Yale and Towne Manufacturing Company, 9 Murray street, New York City, manufacturers of builders hardware. This lock is known as a 24-hour lock and is a sturdy rim lock, with a heavy solid dead bolt which springs locked when wanted, but which can only be unlocked from the outside by its key, while the knob from the inside unlocks it.

CUTTING AND WELDING OF METALS. The American Oxhydric Company, of Milwaukee, Wis., the owners and manufacturers of the "Oxhydric Process" for cutting and welding of metals, have issued a 24-page catalogue describing the various apparatus used for this purpose and gives a full and interesting description of the applications of the American Oxhydric Process, which will prove valuable reading to any one interested in autogenous and heterogenous welding. The company will be glad to answer any questions and furnish copies of the catalogue.

IT STANDS ANY HEAT is the title of a handsome calendar just issued by the Waterbury Crucible Company, manufacturers of crucibles and plumbago products, of Waterbury, Conn. The calendar has a monthly date pad of convenient size and easily readable figures. The pad is mounted on unusually heavy pasteboard backing, 11 x 14 inches. The excellent heat resisting qualities of the crucible made by this concern, are exemplified by a realistic picture of the infernal regions, in which Satan is serenely contemplating the process of combustion in a large crucible, while his attendant imps add fuel to the fire.

WHITE LEAD.—The National Lead Company, 111 Broadway, New York City, describe in a six-page folder the particular advantages of their new packages for putting up white lead products. These receptacles are steel kegs, which are claimed to be in a number of respects superior to the ordinary oak kegs. These claims are enumerated under five heads. First.—No absorption of the oil. Second—Lighter in weight, therefore saving freight. Third—Occupies less space and thereby saving storage. Fourth—Can be used after emptying as they make paint pots and are useful as household utensils. Fifth—The heads are not destroyed, thus making convenient lids that protect the contents.

STEEL BALL BURNISHING PROCESS. The Abbot Ball Company, 18 Hicks street, Hartford, Conn., have published a circular descriptive of the process of burnishing with steel balls. These balls are made by the Abbot Company solely for this purpose and are guaranteed as to temper and finish. They state that they make no seconds and that this process takes the place of buffing both before and after plating on all such articles as jewelry, rings, chains, buttons, hose supporters, corset trimmings, clasps, pins, collar buttons, bag and purse ornaments, electrical goods, typewriter and adding machine parts, cabinet trunk and saddlery hardware, thimbles, metal novelties and all small cast and sheet metal parts.

ELECTRIC AND GAS LIGHT FIXTURES. The Goodwin & Kintz Company, of Winsted, Conn., have issued Supplement 33, to be used in connection with their catalogue No. 31. This supplement describes and gives the prices as well as half-tone cuts of the various types of gas, electric light, portables, figures and electric light fixtures. Some of the examples shown in this bulletin represent the very highest types of modern design. The company call special attention that their portables are always mechanically perfect and are invariably straight and plumb. The Goodwin & Kintz Company manufacture also kerosene oil lamps, clocks, candelabra, vases, mounted glassware, inkstands, plateaux, photograph frames, etc. These catalogues will be sent to any one interested in any of these products.

AD NEWS

The Detroit Foundry Supply Company, Detroit, Mich., are again calling attention to their complete line of platers' and foundry supplies.

The Thomas W. Pangborn Company, 90 West street, New York, illustrate their type "C" sand blast, which they state will clean castings at half the ordinary cost.

The Bilz sand mixer and sifter, a new machine which has been installed in a number of prominent bronze and iron foundries, is advertised elsewhere in this issue.

The Baird Machine Company, Oakville, Conn., invite those interested in tumbling barrels to send for Bulletin 300, which describes the excellent features of Baird barrels.

The General Chemical Company, 608 Bourse Building, Philadelphia, Pa., call attention to their high grade phosphorus which is especially suitable for phosphor bronze, tin, copper, etc. They also manufacture hydrofluoric acid for cleaning purposes.

The Riverside Metal Refining Company, Connellsville, Pa., announce that they carry in stock for immediate shipment all compositions of brasses and bronzes. They also make alloys to order, and are sole manufacturers of "Riverside Anti-Acid Bronze."

L. Vogelstein & Company, 42 Broadway, New York, have a card in this issue advertising their copper, tin, lead and spelter.

They are agents for Aaron Hirsch & Son, Halberstadt, Germany; selling agents for The American Zinc, Lead and Smelting Company, Caney and Dearing, Kansas; and general agents for United States Metals Refining Company, Chrome, N. J., and Grasselli, Ind.

COPPER PRODUCTION

(Issued by the Copper Producers' Association.)

	February, 10, 1910. Pounds.
Stock of marketable copper of all kinds on hand at all points in the United States January 1, 1910....	141,766,111
Production of marketable copper in the United States from all domestic and foreign sources during January, 1910	116,547,287
	258,313,398
Deliveries:	
For domestic consumption..... 78,158,387	
For export 81,691,672	
	159,850,059
Stock of marketable copper of all kinds on hand at all points in the United States February 1, 1910..	98,463,339
Stocks decreased during the month of January.....	43,302,772

METAL MARKET REVIEW.

NEW YORK, February 10, 1910.

COPPER.—The price of Standard Copper in the London market declined during the month of January nearly £2 per ton. The delayed merger and the continued increase in the stocks abroad are probably the causes of the weaker tone.

In the New York market there has been a fair demand from consumers and although the exports were not as heavy as during December, it is predicted the stocks of copper in America will probably show a further decrease.

Statistically, the copper market seems to be getting worse each month, the foreign figures give a total visible supply of copper on February 1 of 110,820 tons against a visible supply of 52,940 tons a year ago. The exports during January were 26,598 tons, being 1,500 tons less than the exports in December, and yet in the face of this slight decrease in exports the foreign visible supply increased nearly 2,000 tons during the month. These foreign figures only give the stocks in England and France, the stocks being carried in Germany and other countries are not accounted for.

Plans are being gradually consummated for the big merger and it will surely take another six months to get all the proposed companies in line. At present writing it looks as though the merger will never be carried through in face of all this trust agitation but plans may continue to be published with a view to hold up the market.

The most interesting event with reference to the future of the copper market and one that is going to be a highly important factor in the consumption of copper is the storage battery car lately invented by Thomas Edison. If the claims made for this car are verified, and so far the cars already worked have pretty well proved all these claims, it means that eventually these storage battery cars will gradually replace every trolley line in the country. One has but to figure up the millions of miles of trolley wire now in use to get some idea of the enormous decrease in the consumption of copper, and at the same time one must figure all this trolley wire as gradually coming on the market again. These storage battery cars have not affected the copper market in any way so far, but it will be interesting to note a year hence how many of these cars are running.

The market closes dull and easier, with Lake at 13⅞; Electrolytic, 13⅝; Casting brands, 13½ cents.

TIN.—The London tin market declined about £5 per ton. This was rather expected in view of the heavy stocks in America.

In the New York market there has been a good consuming demand, but in face of this, the total visible supply on Feb. 1 was nearly 3,000 tons heavier than a month ago and nearly 2,000 tons more than a year ago. The consumption is figured at 3,500 tons against 3,200 tons in December.

The market opened at around 33½ cents, and prices gradually declined to close to 32½ cents, showing a decline for the month of just about 1 cent per pound. The market today is easy at 32½ cents for 5-10-ton lots spot, with futures about 5 points lower.

LEAD.—The foreign lead market has held steady at around £13 10s.

The New York market has ruled fairly strong at 4.70 to 4.75 New York. There has been a better demand and with the best months of the year in sight the demand is likely to increase. We quote New York market today 4.75 New York carload lots. In St. Louis the market is steady at 4.55 to 4.60.

SPELTER.—The foreign spelter market is firmly held at around £23 5s. This is in accordance with the foreign syndicate agreement. How much longer this agreement is going to last is another story.

The New York market for spot spelter has been held fairly steady at 6.25 to 6.20 while future shipments are freely offered at 20 to 30 points low. March, April and May deliveries are offered at 5.90 New York. This price is about ⅛ cent per pound below the high prices late in 1909. The market looks weak and consumers are inclined to hold off.

ANTIMONY.—The foreign market is steady at £30 10s. for Halletts, and £29 10s. for ordinary.

In the New York market prices are unchanged Cooksons, 8½; Hallet's, 8⅜; Hungarian grade, 7½ cents.

ALUMINUM.—The foreign aluminum market is firmer and prices have advanced nearly 1 cent per pound during a month. For large lots early January the price was 21½ to 21¾ cents, while today for prompt or March shipments importers ask 22½ to ⅝ cents. The domestic market is unchanged at the nominal quotation of 24 cents.

SILVER.—The London silver market has declined 3/16d. during the month, opening at 24 3/16d., and closing at 24d.

In New York the market has been dull with prices at the close ½ cent lower at 52 cents.

QUICKSILVER.—The market for quicksilver has been easier with price for wholesale lots $1.50 per flask lower at $51.00 for larger lots and $52.50 to $53 for jobbing lots.

PLATINUM.—The platinum market is easier again at $29 per ounce for ordinary, and $34.50 for hard. Scrap is worth around $24.

There has been no change in the base price of sheet metals and the demand has not been very brisk. Sheet copper, 18 cents base, Wire, 15¼ cents base, and seamless brass tubing, 18 cents.

OLD METALS.—The old metal market has been very dull and prices are about the same as a month ago. Consumers are only buying for their immediate needs, and the market generally is inclined to be easier.

THE JANUARY MOVEMENTS IN METALS

	Highest.	Lowest.	Average.
COPPER.			
Lake	14.00	13.80	13.95
Electrolytic	13.90	13.50	13.70
Casting	13.75	13.50	13.65
TIN	33.50	32.45	32.75
LEAD	4.75	4.70	4.73
SPELTER	6.40	6.20	6.25
ANTIMONY (Hallett's)	8.25	8.40	8.25
SILVER	.52⅝	.52	52.10

WATERBURY AVERAGE

The average price of lake copper per pound as determined monthly at Waterbury, Conn.

1909.—Average for year, 13.416. 1910.—Jan. 13⅞.

DAILY METAL PRICES

We have made arrangements with the New York Metal Exchange by which we can furnish our readers with the Official Daily Metal Market Report of the Exchange and a year's subscription to THE METAL INDUSTRY for the sum of $10. The price of the report alone is $10. Sample copies furnished for the asking. We can furnish daily telegraphic reports of metal prices. Address THE METAL INDUSTRY, 99 John street, New York.

Metal Prices, February 11, 1910

NEW METALS.

	Price per lb Cents.
COPPER—PIG, BAR AND INGOT AND OLD COPPER. Duty Free, Manufactured 2½c. per lb.	
Lake, carload lots	13.85
Electrolytic, carload lots	13.62½
Casting, carload lots	13.50
TIN—Duty Free.	
Straits of Malacca, carload lots	32.50
LEAD—Duty Pigs, Bars and Old, 2½c. per lb.; pipe and sheets, 2¾c. per lb.	
Pig lead, carload lots	4.75
SPELTER—Duty 1¾c. per lb. Sheets, 1⅝c. per lb.	
Western carload lots	6.25
ALUMINUM—Duty Crude, 7c. per lb. Plates, sheets, bars and rods, 11c. per lb.	
Small lots	28.00
100 lb. lots	25.00
Ton lots	23.00
ANTIMONY—Duty 1½c. per lb.	
Cookson's, cask lots, nominal	8.50
Hallett's, cask lots	8.25
Other cask lots	7.50
NICKEL—Duty Ingot, 6c. per lb. Sheet, strips and wire 35% ad valorem.	
Shot, Plaquettes, Ingots, Blocks, according to quantity	.45 to .60
MANGANESE METAL—Duty 20%	.80
MAGNESIUM METAL—Duty 3 cents per pound and 25% ad valorem	$1.60
BISMUTH—Duty free	1.80
CADMIUM—Duty free	.75
	Price per oz.
GOLD—Duty free	$20.67
SILVER—Duty free	.52
PLATINUM—Duty free	29.00
QUICKSILVER—Duty 7c. per lb. Price per pound	70c. to 75c.

OLD METALS.

Dealers' Buying prices. Cents per lb.		Dealers' Selling prices. Cents per lb.
12.25 to 12.50	Heavy Cut Copper	13.00 to 13.50
12.00 to 12.25	Copper Wire	12.75 to 13.00
10.75 to 11.00	Light Copper	11.50 to 11.75
11.25 to 11.75	Heavy Mach. Comp	12.00 to 12.50
8.75 to 9.00	Heavy Brass	9.50 to 9.75
6.50 to 7.00	Light Brass	7.50 to 7.75
7.75 to 8.25	No. 1 Yellow Brass Turnings	8.50 to 8.75
9.00 to 9.50	No. 1 Comp. Turnings	10.00 to 10.50
4.25 to 4.50	Heavy Lead	4.40 to 4.50
4.50 to 4.75	Zinc Scrap	—— to 5.00
5.00 to 5.50	Scrap Aluminum, turnings	5.00 to 5.50
10.00 to 12.00	Scrap Aluminum, cast, alloyed	11.00 to 13.00
14.00 to 15.00	Scrap Aluminum, sheet (new)	16.00 to 18.00
19.50 to 20.00	No. 1 Pewter	23.00 to 24.00
20.00 to 25.00	Old Nickel	20.00 to 25.00

INGOT METALS.

	Price per lb. Cents.
Silicon Copper, 10% to 20% ....according to quantity	28 to 35
Silicon Copper, 30% guaranteed. " "	38
Phosphor Copper, 5% " "	19 to 21
Phosphor Copper 10% to 15%, guaranteed " "	28 to 30
Manganese Copper, 30% " "	30 to 35
Phosphor Tin " "	34 to 36
Brass Ingot, Yellow " "	9 to 10
Brass Ingot, Red " "	12 to 13
Bronze Ingot " "	11 to 12
Manganese Bronze " "	17 to 19
Phosphor Bronze " "	13 to 16
Casting Aluminum Alloys " "	29 to 35

PHOSPHORUS—Duty 18c. per lb.
According to quantity ..... 30 to 35

PRICES OF SHEET COPPER.

BASE PRICE, 18 Cents per Lb. Net.

PRICES MENTIONED BELOW ARE FOR QUANTITIES OF 100 LBS. AND OVER.

SIZE OF SHEETS.		64 oz. and over 50 lb. sheet 30 x 60 and heavier.	32 oz. to 64 oz. 25 to 50 lbs. sheet 30 x 60.	24 oz. to 32 oz. 18¾ to 25 lb. sheet 30 x 60.	16 oz. to 24 oz. 12½ to 18¾ lb. sheet 30 x 60.	14 oz. and 15 oz. 11 to 12½ lb. sheet 30 x 60.	12 oz. and 13 oz. 9½ to 11 lb. sheet 30 x 60.	10 oz. and 11 oz. 7¾ to 9½ lb. sheet 30 x 60.	8 oz. and 9 oz. 6¼ to 7¾ lb. sheet 30 x 60.	Lighter than 8 oz.
		Cents Per Pound Over Base Price for Soft Copper.								
Not wider than 30 ins.	Not longer than 72 inches.	Base	Base	Base	Base	1	2	3	6	9
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	1	3	6	9	
	Longer than 96 inches.	"	"	"	"	2	6			
Wider than 30 ins. but not wider than 36 inches.	Not longer than 72 inches.	"	"	"	"	2	4	7	10	
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	2	6	9		
	Longer than 96 inches. Not longer than 120 inches.	"	"	"	1	3				
	Longer than 120 inches.	"	"	1	2					
Wider than 36 ins. but not wider than 48 inches.	Not longer than 72 inches.	"	"	1	2	4	7	10		
	Longer than 72 inches. Not longer than 96 inches.	"	"	1	3	5	8			
	Longer than 96 inches. Not longer than 120 inches.	"	"	2	4	8				
	Longer than 120 inches.	"	1	3	6					
Wider than 48 ins. but not wider than 60 inches.	Not longer than 72 inches.	"	Base	1	3	6	11			
	Longer than 72 inches. Not longer than 96 inches.	"	"	2	4	9				
	Longer than 96 inches. Not longer than 120 inches.	"	1	3	6					
	Longer than 120 inches.	1	2	4	8					
Wider than 60 ins. but not wider than 72 ins.	Not longer than 96 inches.	Base	1	3	8					
	Longer than 96 inches. Not longer than 120 inches.	"	2	5	10					
	Longer than 120 inches.	1	3	8						
Wider than 72 ins. but not wider than 108 ins.	Not longer than 96 inches.	1	3	6						
	Longer than 96 inches. Not longer than 120 inches.	2	4	7						
	Longer than 120 inches.	3	5	9						
Wider than 108 ins.	Not longer than 132 inches.	4	6							
	Longer than 132 inches.	5	8							

The longest dimension in any sheet shall be considered as its length.

CIRCLES, SEGMENTS AND PATTERN SHEETS, advance over prices of Sheet Copper required to cut them from. 3 cents per pound.

COLD OR HARD ROLLED COPPER, 14 oz. per square foot, and heavier, add ..... 1 " " "

COLD OR HARD ROLLED COPPER, lighter than 14 oz., per square foot, add ..... 2 " " "

POLISHED COPPER, 20 INCHES WIDE and under, advance over price for Cold Rolled Copper of corresponding dimensions and thickness ..... 1 " " sq. ft.

POLISHED COPPER, WIDER THAN 20 INCHES, advance over price for Cold Rolled Copper of corresponding dimensions and thickness ..... 2 " " " "

COLD ROLLED COPPER, PREPARED SUITABLE FOR POLISHING, same as Polished Copper of corresponding dimensions and thickness.

COLD ROLLED AND ANNEALED COPPER SHEETS OR CIRCLES, same price as Cold or Hard Rolled Copper of corresponding dimensions and thickness.

ROUND COPPER ROD, ⅜ inch diameter or over ..... Base Price.
(Rectangular, Square and Irregular Shapes, Copper Rod, Special Prices.)

ZINC—Duty, sheet, 1⅝c. per lb.	Cents per lb.
Carload lots, standard sizes and gauges, at mill	7.75 less 8%
Casks	8.25
Open casks	8.75

Metal Prices, February 11, 1910

PRICES ON BRASS MATERIAL—MILL SHIPMENTS.

In effect November 22, 1909, and until further notice.

To customers who purchase less than 40,000 lbs. per year and over 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.14¼	$0.15¾	$0.17¾
Wire	.14¼	.16½	.18
Rod	.14¼	.16½	.19
Brazed tubing	.19⅝	—	.21½
Open seam tubing	.17⅝	—	.19½
Angles and channels, plain	.17⅝	—	.19½

50% discount from all extras as shown in American Brass Manufacturers' Price List No. 7.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring, drawing and spinning brass...	½c.	per lb. net advance
" —Best spring, drawing and spinning brass....	1½c.	" " " "
Wire —Extra spring and brazing wire	½c.	" " " "
" —Best spring and brazing wire	1c.	" " " "

To customers who purchase less than 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.15¼	$0.16¾	$0.18¾
Wire	.15¼	.17½	.19
Rod	.15¼	.17½	.20
Brazed tubing	.20⅝	—	.22½
Open seam tubing	.18⅝	—	.20½
Angles and channels, plain	.18⅝	—	.20½

5% discount from all extras as shown in American Brass Manufacturers' Price List No. 7.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring, drawing and spinning brass...	½c.	per lb. net advance
" —Best spring, drawing and spinning brass....	1½c.	" " " "
Wire —Extra spring and brazing wire	½c.	" " " "
" —Best spring and brazing wire	1c.	" " " "

BARE COPPER WIRE—CARLOAD LOTS.

15.25 per lb. base.

SOLDERING COPPERS.

300 lbs. and over in one order	18½c.	per lb. base.
100 lbs. to 300 lbs. in one order	19c.	" " "
Less than 100 lbs. in one order	20½c.	" " "

PRICES FOR SEAMLESS BRASS TUBING.

From 1¼ to 3½ in O. D. Nos. 4 to 13 Stubs' Gauge, 18c. per lb.
Seamless Copper Tubing, 22c. per lb.

For other sizes see Manufacturers' List.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron Pipe Size	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6
Price per lb.	26	25	20	19	18	18	18	18	18	18	18	19	20	22	24	25

PRICE LIST OF IRON LINED TUBING—NOT POLISHED.

	Per 100 feet Brass.	Bronze.
⅜ inch	$8	$9
½ inch	8	9
⅝ inch	10	11
¾ inch	12	13
⅞ inch	14	15
1 inch	18	20
1¼ inch	22	24
1¼ inch	25	27
1½ inch	32	35
1¾ inch	45	48
2 inch	56	60

Discount 45 and 5%.

PRICES FOR MUNTZ METAL AND TOBIN BRONZE.

Muntz or Yellow Metal Sheathing (14" x 48")	15c.	lb. net base
" " " Rectangular sheets other than Sheathing	17c.	" " "
" " " Rod	15c.	" " "
Tobin Bronze Rod	16c.	" " "

Above are for 100 lbs. or more in one order.

PLATERS' METALS.

Platers' bars in the rough 23¼c. net.

German silver platers' bars dependent on the percentage of nickel, quantity and general character of the order.

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturers.

PRICES FOR SHEET BLOCK TIN AND BRITANNIA METAL.

Not over 18 in. in width, not thinner than 23 B. S. Gauge, 2c. above price of pig tin in same quantity.

Not over 35 in. in width, not thinner than 22 B. S. Gauge, 3c. above price of pig tin.

PRICE SHEET FOR SHEET ALUMINUM—B. & S. Gauge.

	Wider than.....	3in.	6in.	14in.	16in.	18in.	20in.	24in.	30in.	36in.
	and including.....	12in.	14in.	16in.	18in.	20in.	24in.	30in.	36in.	40in.
	in coils.									
No. 13 and heavier		34	34	36	36	36	36	39	39	39
" 14		34	34	36	36	36	36	39	39	39
" 15		34	34	36	36	36	36	39	39	39
" 16		34	34	36	36	36	36	39	39	39
" 17		34	34	36	36	36	36	39	39	39
" 18		34	34	36	36	36	36	39	39	42
" 19		34	34	36	36	36	36	39	40	43
" 20		34	36	36	36	36	38	41	42	44
" 21		34	38	38	38	38	40	43	44	50
" 22		34	38	38	38	40	40	43	47	51
" 23		34	38	38	38	40	40	43	49	52
" 24		34	38	40	42	42	42	45	51	54
" 25		36	39	41	43	43	43	46	53	57
" 26		36	39	42	46	46	46	51	55	61
" 27		36	40	44	48	48	49	54	58	64
" 28		36	40	46	48	49	49	56	62	67
" 29		38	41	48	50	52	52	61	67	72
" 30		38	42	50	52	56	62	69	72	77
" 31		43	47	55	58	63	71	74	77	83
" 32		45	49	57	61	69	77	91	90	95
" 33		47	51	60	65	73	84	91	100	110
" 34		50	55	62	70	78	91	103	110	120
" 35		..	65	70	80	90	100	115	125	..
" 36		..	80	90	100	115	120	135	..	..
" 37		..	104	114	129	144	159	174	..	..
" 38		..	124	139	154	169	184	204	..	..
" 39		..	144	164	184	204	224	..	..	..
" 40		..	174	204	224	244	..	..	..	..

In flat rolled sheets the above prices refer to lengths between 2 and 3 feet. Prices furnished by the manufacturers for wider and narrower sheet. All columns except the first refer to flat rolled sheet. Prices are 100 lbs. or more at one time. Less quantities 3c. lb. extra. Charges made for boxing.

PRICE LIST SEAMLESS ALUMINUM TUBING.

STUBS' GAUGE THE STANDARD. SIZES CARRIED IN STOCK.
Outside Diameters. BASE PRICE, 25 Cents per Pound.

Stubs' Gauge.	Inches.	¼ in.	5-16 in.	⅜ in.	½ in.	⅝ in.	¾ in.	⅞ in.	1 in.	1¼ in.	1½ in.	1¾ in.	2 ins.	2½ ins.	3 ins.	3½ ins.	4 ins.	4½ ins.
11.	.120.	..	..	..	..	..	..	..	27	24	..	..	14	12	10	9	16	23
12.	.109.	..	..	..	..	..	..	..	26	..	..	..	15	..	..	..	..	..
14.	.083.	..	..	..	..	..	..	..	..	..	..	..	17	..	..	..	..	..
16.	.065.	..	..	..	..	..	28	27	27	24	23	21	21	21	21	27	31	37
18.	.049.	..	..	..	..	33	30	29	28	25	26	26	26	..	..	..	..	..
20.	.035.	117	..	46	39	34	33	32	30	29	30	30	30	31	38	49	58	81
21.	.032.	..	..	..	40	..	..	..	..	..	..	..	..	..	..	..	..	..
22.	.028.	138	98	48	42	38	37	35	34	..	..	45	..	..	..	..	..	..
24.	.022.	188	133	108	88	79	73	62	60	66	..	..	..	..	..	..	..	..

Prices are for ten or more pounds at one time. For prices on sizes not carried in stock send for Manufacturers' List.

PRICE LIST FOR ALUMINUM ROD AND WIRE.

Diameter. B. & S. G'ge.	000 to No. 10.	No. 11.	No. 12.	No. 13.	No. 14.	No. 15.	No. 16.	No. 17.	No. 18.	No. 19.	No. 20.	No. 21.	No. 22.
Price, per lb....	32	32½	32½	33	33½	34	34½	35	36	37	38	43	46

200 lbs. to 30,000 lbs., 3 cents off list; 30,000 lbs. and over, 4 cents off list.

PRICE LIST FOR GERMAN SILVER IN SHEETS AND ROLLS.

Per cent.	Price per lb.	Per cent.	Price per lb.
12	$0.52	16	$0.58
13	.53	17	.59
14	.54	18	.60
15	.55		

These prices are for sheets and rolls over 2 inches in width, to and including 8 inches in width and to No. 20, inclusive, American or Brown & Sharpe's Gauge. Prices are for 100 lbs. or more of one size and gauge in one order. Discount 50%.

GERMAN SILVER TUBING.

4 per cent.	to No. 19,	B. & S. Gauge,	Inclusive	$0.60
6 "	" 19,	"	"	.70
9 "	" 19,	"	"	.85
12 "	" 19,	"	"	1.00
15 "	" 19,	"	"	1.15
16 "	" 19,	"	"	1.20
18 "	" 19,	"	"	1.30

German Silver Tubing thinner than No. 19 B. & S. Gauge add same advances as for Brazed Brass Tube.

For cutting to special lengths add same advances as for Brazed Brass Tube. Discount 40%.

PRICE OF SHEET SILVER.

Rolled sterling silver .925 fine is sold according to gauge quality and market conditions. No fixed quotations can be given as prices range from 2c. below to 6c. above the price of bullion.

Rolled silver anodes .999 fine are quoted at 2c. to 3c. above the price of bullion.

THE UNITED STATES ALUMINUM COMPANY

PITTSBURGH, PA.

ALUMINUM

SHEET TUBING
EXTRUDED SHAPES
ROD RIVETS WIRE
ELECTRICAL CONDUCTORS

Branch Offices

NEW YORK—99 John St.
BOSTON—131 State St.
CHICAGO—Old Colony Bldg.
PITTSBURGH—1504 Park Bldg.
PHILADELPHIA—320 Witherspoon Bldg.
ROCHESTER—406 Powers Block
CLEVELAND—719 Garfield Bldg.
WASHINGTON—514 Nat. Met. Bk. Bldg.
DETROIT—1515 Ford Bldg.

HENDRICKS BROTHERS
Manufacturers of
Sheet and Bar Copper
COPPER FIREBOX PLATES
and STAYBOLTS
WIRE and BRAZIER'S RIVETS
IMPORTERS AND DEALERS IN
INGOT COPPER, BLOCK TIN,
SPELTER, LEAD, ANTIMONY
BISMUTH, NICKEL, Etc.
49 Cliff Street, NEW YORK

Established 1802 Cable Address: "Scovill"
SCOVILL MFG. CO.
WATERBURY, CONN.
THE LARGEST AND MOST FULLY EQUIPPED BRASS ROLLING MILLS AND METAL GOODS MANUFACTURING ESTABLISHMENT IN THE WORLD
Estimates for Specialties in Brass, German Silver and Alum num furnished on application. DEPOTS:
NEW YORK: 75 Spring St. BOSTON: 170 Summer St. CHICAGO: 210 Lake St.

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General Offices, Mills and Factories.
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NEW YORK OFFICE, 99 JOHN STREET.
Providence (R. I.) Store, 131 Dorrance St.
Shipments Upon Receipt of Order From Large Stock of
SEAMLESS DRAWN BRASS AND COPPER TUBING
BRASS { SHEET ROD WIRE
COPPER { SHEET ROD WIRE
GERMAN SILVER { SHEET ROD WIRE
AT WATERBURY

Non-Corrosive Finest Quality
COPPER AND YELLOW
(Muntz) Metal
Naval Brass
Naval Bronze
Manganese Bronze
Plates, Sheets, Bolts, Bars, Rods, Nails, Tacks, &c.
Taunton-New Bedford Copper Co.
NEW BEDFORD, MASS.
17 Water St., New York 61 Batterymarch St., Boston

C. G. HUSSEY & CO.
PITTSBURGH, PENNA.
Manufacturers of
COPPER
In Sheets, Plates, Rolls
ANODES
Tacks and Nails

Bridgeport Brass Co.
BRIDGEPORT, CONN.
Postal Telegraph Building,
Broadway and Murray St., New York
17 N. 7th Street, Philadelphia
Manufacturers of
Brass and Copper { Sheet, Tubing, Wire and Rods.
Metal Goods Made to Order from Sheet, Rod, Wire and Tubing

BRASS and COPPER in Sheets and Rolls
SILVER PLATED METAL (for Coach Lamps)
BRITANNIA METAL
B. & M. BABBITT METAL for Bearings
LINING METAL for Automobile Bearings and Copper for Electrical Purposes
H. K. & F. S. BENSON
GLEN RIDGE, N. J.

THE SEYMOUR MFG. CO.
SEYMOUR, CONN.
German Silver
BRASS, COPPER and BRONZE IN SHEETS, WIRE, RODS and TUBES
COPPER AND NICKEL ANODES
Resistance Wires, Wire, Shot Copper

UNITED WIRE & SUPPLY COMPANY
109 SUMMER STREET,
PROVIDENCE, R. I.
SEAMLESS BRASS and COPPER TUBING 1" O. D. and smaller in thin gauges. Lightning Rod Points and other tapered tubes.

The Ansonia Brass and Copper Co.
99 JOHN ST., NEW YORK
MANUFACTURERS OF
BRASS and COPPER Sheets, Tubes, Rods and Wire
SOLE MANUFACTURERS TOBIN BRONZE
(Trade-Mark Registered)

PHENIX TUBE CO.
Manufacturers of
Brass and Bronze Iron Lined Tubes
Brazed Steel Tubes,
Round and Square.
Main Office and Mills: Brooklyn, N. Y. City Branch Offices: Chicago, San Francisco

Baltimore Copper Smelting and Rolling Company
BALTIMORE, MARYLAND
SHEET COPPER

ΜΕΤΑΛΟΣ TRADE MARK
"RIVERSIDE" German Silver Phosphor Bronze
Sheets, Rods, Wire, Ingots, Castings, Jewelers' Bars and Alloys
The Riverside Metal Co.
Riverside, Burlington Co., N. J.

THIS SPACE
For Sale
SEND for RATES

SEE PAGE 42 FOR WANT ADVERTISEMENTS

DIRECTORY

METAL ROLLING MILLS.

INGOT, PLATE, SHEET, ROD, WIRE, TUBE, METAL GOODS.

A. H. Wells & Co.
WATERBURY, CONN.
MANUFACTURERS OF
SEAMLESS..... NICKEL SILVER, BRASS, COPPER, BRONZE AND PURE COPPER **TUBING**
TUBING FOR ELECTRICAL PURPOSES
Odd and Special Shapes, and Small Tubing, a Specialty
—ALSO THE—
Bourdon Steam Gauge Springs
All sizes from 8 to 36, B. & S. Gauge.

The BUFFALO TUBE CO.
255 RANO STREET
BUFFALO, N. Y.
SMALL SIZES
Seamless Brass and Copper Tubing
PROMPT DELIVERY

LINTON & CO.
95 PINE STREET PROVIDENCE, R. I.
MANUFACTURERS OF
SEAMLESS BRASS . . **TUBING**
In Small Sizes
GOLD SOLDER, sheet or wire.
SILVER SOLDER, sheet or wire.
SHEET BRASS SOLDER

THE PILLING BRASS CO.
WATERBURY, CONN.
Brass and German Silver
6 in. and narrower
.005 and thinner
PLATERS' METAL A SPECIALTY

Established 1859. Long Distance 'Phone.
John Toothill
White Metal Rolling Mill
Casting, Rolling and Refining for the trade.
Sheet Block Tin and Britannia
ROCHELLE PARK, NEW JERSEY.

Wm. F. Renziehausen Co.
Rollers of Silver Anodes and Sterling Silver
ALSO DEALERS IN
FINE GOLD AND SILVER
43-47 Oliver St., Newark, N.J.
Long Distance Phone 3789 R.

SEAMLESS STEEL TUBING
From 4 in. Diameter to 1-64 in.
Finished Bright, Smooth and Accurate to 1-1000 In. Inside and Out
Tool Steel Tubing. Soft Steel Tubing. Also Small Brass, Copper and Aluminum Tubing.
ELLWOOD IVINS TUBE WORKS
Oak Lane Station, Philadelphia, Pa.

ROLLED FIRELESS STERLING SILVER
SILVER SOLDERS, ANODE SILVER and SILVER WIRE
For further information address
JOHN J. JACKSON CO.
91 Mechanic St. NEWARK, N. J.

BRITANNIA METAL
AND SHEET BLOCK TIN
CASTING, ROLLING and REFINING FOR THE TRADE.
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MANUFACTURERS OF PLATED SHEET METALS

ELECTROPLATED STEEL STRIPS
Steel and Zinc Sheets in Nickel, Brass, Copper or Tombac finish, manufactured by
HILLE & MÜLLER
The Largest Works of the World in this line of manufacture
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NATIONAL SHEET METAL CO.
Manufacturers of
PLATED SHEET METALS
FANCY ROLLED METALS
Nickelzinc, Brasszinc, Copperzinc, Bronzezinc, Nickeltin, Brasstin, Coppertin, Bronzetin Sheet Zinc, polished and unpolished, for stamping.
Large Saving to Manufacturers *Last Year's Sales 1,000,000 lbs.*
For Further Information Address Office: PERU, ILLINOIS

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LEAD AND ZINC SMELTERS AND MANUFACTURERS

PIG LEAD, SPELTER, SHEET ZINC AND ROD, ACIDS

ST. JOSEPH LEAD COMPANY

Pig Lead

5 Nassau St., New York

Horsehead Spelter

The Original Brand of Pure Spelter

Indispensable in the manufacture of

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Manufacturers of

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High Grade Spelter

GOLDEN ROD BRAND

Suitable for High Grade Brass Work, Cartridge Metal, Etc.

ALUMINUM ALLOYS, Etc.

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HIGH GRADE SPELTER

SUITABLE FOR ALL PURPOSES

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Smelters of Spelter

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Sheet Zinc and Sulphuric Acid

Zincs for Leclanche Battery

Special Sizes of Zinc to order. Rolled Battery Plates. Selected Plates for Etchers' and Lithographers' use. Selected Sheets for Paper and Card Makers' use. Stove and Washboard Blanks.

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HEGELER BROTHERS, DANVILLE, ILL.

Cold Rolled Zinc

IN COILS FOR

Drawing and Stamping

THE PLATT BROS. & CO.

WATERBURY, CT.

THIS SPACE

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BUYERS AND SELLERS OF NEW AND OLD METALS.

Illinois Smelting & Refining Co.

122 N. Peoria Street, Chicago, Ill. Cable Address "Smelref," Chicago

Manufacturers of

Pig and Bar Lead, Spelter, Babbitt Metals
Linotype, Stereotype, Monotype and Electrotype Metal, Yellow Composition and Phosphor Ingots

Dealers in New and Old Metals, and the Largest Buyers of Zinc Dross, Skimmings, Sal Skimmings, Scrap Zinc and Aluminum

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THE MORTON B. SMITH CO.

241 and 243 Front St., New York

Offer for Sale:

HEAVY COPPER AND WIRE
Ready for the Crucible

COMPOSITION
Carefully Selected

HEAVY YELLOW BRASS
Free from Iron

OLD METALS GENERALLY

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METAL SMELTERS, REFINERS, DEALERS.

BUYERS AND SELLERS OF NEW AND OLD METALS.

THEODORE HOFELLER & CO.

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Our Specialties

Heavy Copper and Copper Wire Cut in Crucible Shape.

Number One Red Brass Scrap.

Heavy Yellow Brass Scrap.

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Phosphorized Metal Co.

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Manufacturers of High Grade PHOSPHOR TIN, PHOSPHOR BRONZE, PHOSPHOR COPPER, Containing up to 15% Phosphorus. MANGANESE COPPER.

Also Dealers in PHOSPHORUS. Lowest Market Prices.

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Smelters of Drosses of All Kinds — Dealers in New and Old Metals

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Dealers in

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Send us Samples of what you have to Sell

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Shonberg's (S) Bearing Metal

M. M. GRADE

Has the best wearing qualities, with the strength and tenacity of phosphor bronze. We claim SUPERIORITY for our "M. M. GRADE" over all other Bearing Metals on the market. We want you to convince yourself by testing and will be pleased to send a sample on request. Send for New Catalog "S."

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FOR SALE

Aluminum, Antimony, Antimonial Lead, Tin, Cadmium

WANTED

Zinc Dross, Zinc Ashes, Flux Skimmings

MAGNESIUM METAL

Improves the Strength of

Copper, Brass, Bronze, Aluminum, Nickel, Zinc Mixtures

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of every description bought and sold. We also carry a complete line of foundry supplies.

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Specialties: Phosphor Bronze and Brass Ingot manufactured according to specifications. We buy: Brass Borings and Turnings, Brass Grindings, Brass Foundry Ashes, Residues of all kinds

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The Granulated Chloride of Zinc is indispensable, as a flux, to Brass, Copper and Aluminum Founders.

Put up in 50 and 100 lbs. iron packages.
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METALLIC PHOSPHORO

(Phosphor Tin Improved)

Prevents the formation of Pores, Blow-holes or Cold-shuts in Castings.
Also prevents excessive shrinkage.

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KALAMAZOO, MICH.

BRASS INGOT

WHIPPLE & CHOATE, BRIDGEPORT, CONN.

For Advertisement of
U. S. REDUCTION CO.
See Page 55

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METAL FOUNDERS, FINISHERS AND SHEET METAL WORKERS.

THE LARGEST EXCLUSIVELY ALUMINUM FOUNDRY IN THE UNITED STATES.

The Fairfield Aluminum Foundry Corp.

FAIRFIELD, CONN. (Bridgeport, Suburb)

Originators and Sole Manufacturers of the famous Lion Brand

ALUMINUM CASTINGS

We are specialists in Aluminum work for Automobile, Government work and Electrical Construction.

THE FAIRFIELD ALUMINUM FOUNDRY CORP., Fairfield, Conn.

CASTINGS

BRASS, BRONZE, ALUMINUM
PHOSPHOR BRONZE
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Large castings a specialty, 1000 to 3000 lbs. and up

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ARE THE ORIGINAL AND ONLY MANUFACTURERS OF

AUTOMOBILE BRAND AERIAL BRAND
ALUMINUM CASTINGS

Our Aluminum Castings are especially adapted to Automobile, Auto Boat and Aerial Construction.

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EVERYTHING IN
ALUMINUM

SPECIAL GOODS made to order.
Correspondence Solicited.

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SEND FOR RATES

THE BUCKEYE ALUMINUM CO.

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are a Ready Reference for Buyers and Sellers. They are classified cards better than the street signs of a business.
In no way can you get such good Trade Publicity at so slight a cost.

RATES FURNISHED FOR THE ASKING

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ETCHING OF METALS

I have had 37 YEARS of practical experience in etching knives, razors, scissors, hammers, axes, revolvers, clock dials, sign plates, door plates.

For a liberal compensation I will teach my process to manufacturers and fit up plants.

I make a specialty of etching plates in steel, copper, brass and zinc for transferring and embossing. Also silverware, including such articles as mirror, brush and comb backs, book and album covers, trays, souvenir spoons and similar articles.

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Silver Deposit Work on China and Glass

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ELECTRO-PLATING

SAFETY RAZORS A SPECIALTY

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NO JOB TOO LARGE OR TOO SMALL FOR US

NORTHERN OHIO MANUFACTURING AND REFINISHING WORKS

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GOLD, SILVER NICKEL PLATING BRONZE AND BRASS

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Prices and further particulars for the asking.

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WIRE-FORMING

such as illustrated by the forms shown below, is the kind of work that this machine was designed particularly to do.

BAIRD AUTOMATIC FOUR-SLIDE WIRE-FORMING MACHINES

have been greatly improved and several new and novel features introduced to produce a more speedy and more efficient machine.

CAN WE NOT INTEREST YOU?

Made in 6 sizes. No. 0 to 5, and working wire up to 3/8" dia. x 15" long.

ASK FOR BULLETIN 100

The Baird Machine Co.
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Telegrams: BAIRDMACHN, WATERBURY
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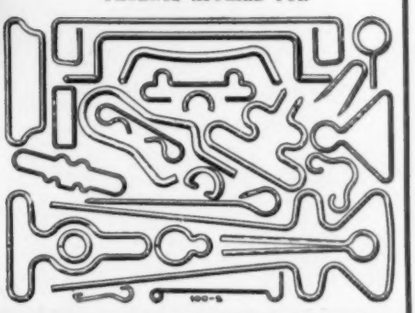

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FOR BURNISHING METAL GOODS BY TUMBLING

1/8 in., 3/16 and 1/4 in.

ALWAYS IN STOCK FOR IMMEDIATE SHIPMENT

MADE EXCLUSIVELY FOR TUMBLING PURPOSES

Send for Catalog B

The ABBOTT BALL CO.

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This Machine will *Dry Out* metal goods after plating, dipping, pickling, etc., without the use of sawdust.

DRIES IN A FEW MINUTES

Very easily operated, and hoist takes out work.

This size has a capacity of 24 quarts.

Also made in a smaller size for manufacturing jewelers, and jobbing plating use, with a capacity of 11 quarts.

The CURTIS DRYER COMPANY

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Illustrating Method of Dumping.

Easily adjustable for more or less violent rattling. Easily dumped.

Easily swept around—it's a one-legged machine. Sieve Cap provides easy way to separate saw dust from tumbled material. Ten sizes. Ask for catalog.

Ask for "The Silent Partner"

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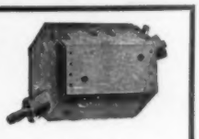
POLISHING OR BURNISHING MACHINE



The most durable and best machine of its class ever put on the market, has stood the test and given entire satisfaction.

We make three styles: { One for burnishing / One for scratchbrushing / One for cutting down

Only complete line ever made.

Ask for Pamphlet MI

Manufactured by **SMITH & RICHARDSON**
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Reliance Polishing Wheels

Reliance Canvas, Sheepskin, Felt, Bull Neck and other wheels are unexcelled.

Write us when in need of reliable wheels at right prices

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for plating small work in one operation

SIMPLE ECONOMICAL EFFICIENT

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COMPLETE PLATING PLANTS INSTALLED

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Brass, Copper and Steel Wire Brushes
An assortment of Machine and Circular Brushes.—
Chandelier Manufacturers', Silver and Nickelplater's Brushes, etc.

Repairs Promptly Attended to.

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ECONOMY WHEELS

Built up in sections. New ones can be substituted at any time. The hub is permanent.
The crimped and tangled wire can't be crystallized and broken by vibration.

The only successful Wire Wheel Brush

Regular sizes from 6 inch diameter and 1¼ inch face, upwards to 15 inch diameter and 2½ inch face.
Special sizes up to 36 inch face. Write for Prices.

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Brooms, Brushes and Foundry Supplies
5407 E. HAMILTON AVE.
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Peerless Polishing Wheel

(Sectional View)

A rim of pieces of leather set edgewise on a center of wood and held firmly by a metallic band on which they are strung. A very durable wheel for medium and heavy work. Not affected by atmospheric changes.

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NEW HAVEN, CONN.

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Manufacturers of

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Importers and Manufacturers of
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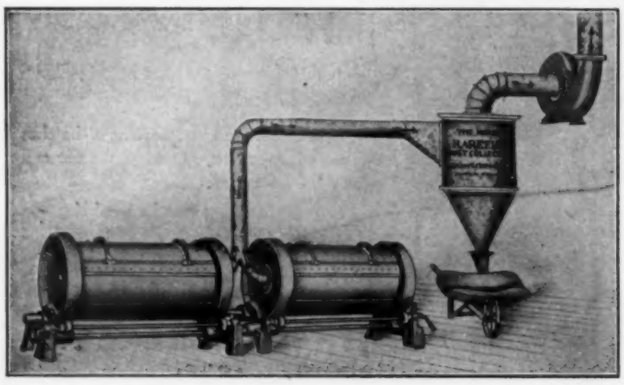
HIGH-CLASS POLISHING WHEELS
For Grinding, Buffing and Polishing
Makers of the Celebrated "WALRINE" Leather Wheel.



NO CLOTH : : NO MOVING PARTS
NO CUTTING OUT OF FANS

The ... Morse Rarefied DUST COLLECTOR

—FOR—

Sand Blast, Tumbling Mills, Emery Wheels

Shipment on 60 days' trial to any part of the United States

MAN'F'D EXCLUSIVELY BY

THE KNICKERBOCKER COMPANY
JACKSON, MICHIGAN

AUTOMATIC CONTINUOUS FEED

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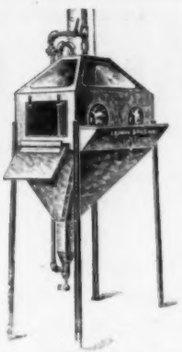

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4 Sizes $17 to $50

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for all Gas Appliances, Furnaces, Blowpipes, Annealing, Melting, Sand Blasting.

TAKE UP THEIR OWN WEAR

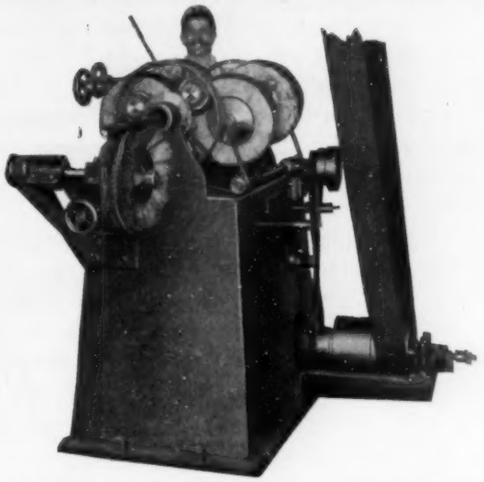
NOISELESS

7 Sizes $17 to $130

Nothing to break. Can't get out of order. No tips or springs on wings. Steady pressure, no fluctuation. Slow speeds, little power.

LEIMAN BROS. DEPT. J 69 John St., NEW YORK

A NEW PATENTED TUBE POLISHING MACHINE



Will polish all lengths of tubes and any diameter up to 8 inches. Will do the work of at least 10 buffing lathes, and saves 100 per cent. in power and composition, and is operated by one unskilled workman.

Made by the

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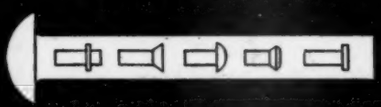

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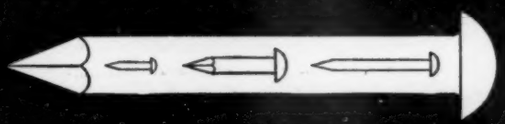

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GERMAN SILVER, ALUMINUM, ETC.
AND
PLATED IN ANY FINISH
HAVE MADE THEM SINCE 1850

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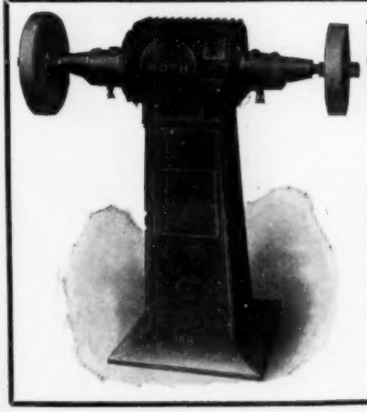

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Electric Polishing and Grinding
LATHES

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1364 W. Adams St.
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NEW YORK OFFICE,
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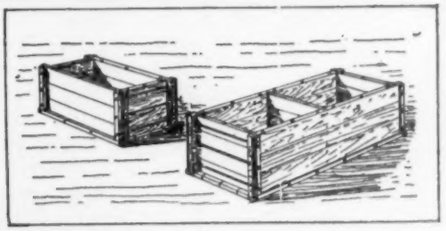
TANKS



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A SPECIALTY
Write for Prices
THE A. T. STEARNS LUMBER CO., Neponset, Boston, Mass.

TALLOW FOR OILING PURPOSES

With the high price of Tallow, this material is expensive for oiling. Why not try our "Polishers' Friend"? If you are using a rag wheel and wish to change from an oiling to a finishing wheel, the use of "Polishers' Friend" will allow of your doing so at a lower cost than good tallow.

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TRIPOLI:—Made a little bit better than necessity prescribes, but so made to win and hold the particular trade, the user who is not figuring on first cost, losing sight of waste in the use of the same. In fact, a **TRIPOLI** which is **TRIPOLI.**

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DETROIT, MICH. Facing Foundry Supplies Foundry Equipment WINDSOR, ONT.

POLISHERS' and PLATERS' SUPPLIES

If You Make

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It may be better suited for your purposes than the material you now use. *It may save you money.*

MISSOURI TRIPOLI FLOUR is made in all grades and colors—"Rose," "Cream" and "White." It is the most effective VERY FINE abrasive known. Our finest grade—"Air Dust"—is an impalpable powder, and yet a very fine abrasive.

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The Gehnrich Sectional Portable OVEN

Standard Size Oven Knocked Down for Shipment.

Used for JAPANNING, LACQUERING, ENAMELING, CORE BAKING, DRYING, TEMPERING, SHERARDIZING

Send for Catalog "TMI."

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The Steiner Sectional Portable Ovens

Designed to meet special conditions. Heated by gas and adaptable for many lines of manufacture. Used for Japanning, Enameling, Baking and Drying. Has many superior advantages.

DRYING OUT BOXES

Fitted with steam coils or gas burners where steam is not available. Send for Catalogue.

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